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Hazardous Materials Technical Center

AD-A210 468

INSTALLATION RESTORATION PROGRAM

PRELIMINARY ASSESSMENT

NAKNEK RECREATIONAL CAMPS, ALASKA

April 1989

Submitted to:

HQ AAC/DEPV
Elmendorf AFB, AK 99506

Submitted by:

Hazardous Materials Technical Center
The Dynamac Building
11140 Rockville Pike
Rockville, MD 20852

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EXECUTIVE SUMMARY

A. Introduction

The Hazardous Materials Technical Center (HMTC) was retained in January 1988 to conduct the Installation Restoration Program (IRP) Preliminary Assessment of Naknek Recreational Camps, Alaska, under Contract No. DLA-900-82-C-4426 with funds provided by Alaskan Air Command (AAC). Hereinafter the Naknek Recreational Camps will be referred to as Naknek Camp I and Naknek Camp II, respectively.

Department of Defense (DoD) policy was directed by Defense Environmental Quality Program Policy Memorandum (DEQPPM) 81-5 dated 11 December 1981, and implemented by Air Force message dated 21 January 1982, as a positive action to ensure compliance of Air Force installations with existing environmental regulations. DEQPPM 81-5 reissued and amplified all previous directives and memoranda on the Installation Restoration Program. DoD policy is to identify and fully evaluate suspected problems associated with past hazardous material disposal sites on DoD facilities, control the migration of hazardous contamination from such facilities, and control hazards to health and welfare that may have resulted from these past operations.

To implement the DoD policy, a four-phased IRP has been directed consisting of:

- Preliminary Assessment (PA) - to identify past spill or disposal sites posing a potential and/or actual hazard to public health or the environment;
- Site Investigation/Remedial Investigation/Feasibility Study (SI/RI/FS) - to acquire data via field studies, for the confirmation and quantification of environmental contamination that may have an adverse impact on public health or the environment and to select a remedial action through preparation of a feasibility study;
- Research, Development and Demonstration (RD & D) - if needed, to develop new technology for accomplishment of remediation; and

- Remedial Design/Remedial Action (RD/RA) - to prepare designs and specifications and to implement site remedial action.

The Naknek Camp I and Camp II Preliminary Assessment included:

- an onsite visit, including interviews with six AAC personnel, conducted by HMTC personnel during 13 June through 24 June 1988;
- the acquisition and analysis of pertinent information and records on hazardous material use and hazardous waste generation and disposal at the installation;
- the acquisition and analysis of available geological, hydrological, meteorological, and environmental data from pertinent Federal, State, and local agencies; and
- the identification of sites on the installation that are potentially contaminated with hazardous materials/hazardous wastes (HM/HW).

B. Major Findings

Past installation operations involved the use and disposal of materials and wastes that were subsequently categorized as hazardous. The major operations of Naknek Camp I and Camp II did not use or dispose of HM/HW; however, these camps were used by the Air Force as dump areas and landfills. Waste oils, fuels, and polychlorinated biphenyls (PCBs) were among the wastes disposed of during these dumping activities.

Interviews with six Air Force personnel, a review of installation records and a field survey resulted in the identification of three disposal and/or spill sites at Naknek Camp I and Camp II that are potentially contaminated with HM/HW. These sites were assigned a Hazard Assessment Score (HAS) according to the U.S. Air Force Hazard Assessment Methodology (HARM). The following is a summary of the findings for each of the identified sites.

Site No. 1 - Camp I-Landfill (HAS-57)

A suspected area, approximately 100 feet by 30 feet, adjacent to a parking lot and on top of a bluff, appeared to be a construction rubble landfill with some empty barrels. This area had relatively high photoionization detector (PID) readings (approximately 20 ppm).

Site No. 2 - Camp I-Barrel Area (HAS-54)

An area adjacent to a quonset hut contained six or more barrels, one marked "JP-4", another with its bottom bulged. Several of the drums were labeled in Air Force inventory markings, and originally contained JP-4 aircraft fuel.

Site No. 3 - Camp II-Stained Area (HAS-54)

Two stained areas were found adjacent to a quonset hut. The larger area, approximately 20 feet by 15 feet, was directly adjacent to the quonset hut. A smaller stained area, approximately 50 yards from the larger stained area, was also found. This area was surveyed with the PID, giving negative results.

C. Conclusions

Information obtained through interviews, records, and field observations resulted in the identification of three sites that are potentially contaminated with HM/HW. At each of the identified sites, the potential exists for contamination of surface water, soils, and/or groundwater and subsequent contaminant migration. Therefore, each of these sites was assigned a HAS according to HARM:

- Site No. 1 - Camp I - Landfill
- Site No. 2 - Camp I - Partially Buried Drums
- Site No. 3 - Camp II - Stained Areas

D. Recommendations

A Site Investigation monitoring program is recommended to confirm the presence or absence of HM/HW at each of the identified sites. The final details of the monitoring program, including the exact locations of groundwater monitoring wells, soil borings and sampling points, will be finalized as part of the Site Investigation program.

In the event that contaminants are detected, a more extensive field survey should be implemented to determine the extent of contamination migration and potential effects to human and ecological receptors.

I. INTRODUCTION

A. Background

The United States Air Force, due to its primary mission, has long been engaged in a wide variety of operations dealing with toxic and hazardous materials. Federal, State, and local governments have developed strict regulations to require that disposers of hazardous materials/hazardous wastes (HM/HW) identify the locations and contents of disposal sites and take action to eliminate the hazards in an environmentally responsible manner. The current Department of Defense (DoD) Installation Restoration Program (IRP) policy was directed by Defense Environmental Quality Program Policy Memorandum (DEQPPM) 81-5 dated 11 December 1981, and implemented by Air Force message dated 21 January 1982, as a positive action to ensure compliance of military installations with existing environmental regulations. DEQPPM 81-5 reissued and amplified all previous directives and memoranda on the IRP. DoD policy is to identify and fully evaluate suspected problems associated with past HM/HW disposal sites on DoD facilities, to control the migration of hazardous contamination, and to control hazards to health and welfare that may have resulted from these past operations. The IRP is a basis for response actions on Air Force installations under the provisions of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 and the Superfund Amendments and Reauthorization Act (SARA) of 1986.

To conduct the IRP Preliminary Assessment for the Naknek Recreational Camps (hereinafter referred to as Camp I and Camp II), the Headquarters Alaskan Air Command/Directorate of Programs and Environmental Planning (HQ AAC/DEPV) retained the Hazardous Materials Technical Center (HMTC) (operated by Dynamac Corporation) in January 1988 under Contract No. DLA-900-82-C-4426.

The Preliminary Assessment comprises the first phase of the DoD IRP and is intended to review installation records to identify possible hazardous waste-contaminated sites and to assess the potential for contaminant migration

from the installation. The Site Investigation (not part of this contract) consists of follow-on field work as determined from the Preliminary Assessment. The Site Investigation includes a preliminary monitoring survey to confirm the presence or absence of contaminants. Upon confirmation of contamination, additional field work is implemented under a Remedial Investigation (not part of this contract) to determine the extent and magnitude of the contaminant migration and provide data necessary for determining appropriate remedial actions, which are evaluated during the Feasibility Study (not part of this contract). Research, Development, and Demonstration (not part of this contract) consists of a technology base development study to support the development of project plans for controlling migration or restoring the installation. Remedial Design/ Remedial Action (not part of this contract) includes those efforts which are required to control identified hazardous conditions.

B. Authority

The identification of hazardous waste disposal sites at Air Force installations was directed by Defense Environmental Quality Program Policy Memorandum 81-5 (DEQPPM 81-5) dated 11 December 1981, and implemented by Air Force message dated 21 January 1982, as a positive action to ensure compliance of Air Force installations with existing environmental regulations.

C. Purpose of the Preliminary Assessment

DoD policy is to identify and fully evaluate suspected problems associated with past hazardous material disposal sites and spill sites on DoD facilities, control the migration of hazardous contamination from such facilities, and control hazards to health or welfare that may have resulted from these past operations. HMTC evaluated the existence and potential for migration of hazardous material contaminants at Naknek Recreational Camps by visiting the installation; reviewing existing installation records concerning the use, generation and disposal of HM/HW; reviewing available environmental information; and conducting interviews with present Air Force personnel who are familiar with past hazardous materials management activities at Naknek Camp I and Camp II.

A physical inspection was made of the various facilities and of the suspected sites. Relevant information collected and analyzed as a part of the Preliminary Assessment included the history of the installation, with special emphasis on the history of past operations and their past HM/HW management procedures; local geological, hydrological, and meteorological conditions that may affect migration of contaminants; local land use,and zoning requirements that could affect the potential for exposure to contaminants; and the ecological settings that indicate environmentally sensitive habitats or evidence of environmental stress.

D. Scope

The Preliminary Assessment program included a pre-performance meeting, an onsite installation visit, review and analysis of the information obtained, and preparation of this report.

The pre-performance meeting was held at HQ AAC/DEPV, Elmendorf Air Force Base (AFB), Alaska, on 13 June 1988. Attendees at this meeting includes representatives of the Alaskan Air Command and HMTC. The purpose of the pre-performance meeting was to provide detailed project instructions, clarification, and technical guidance by AAC, and to define the responsibilities of all parties participating in the Naknek Camp I and Camp II, Preliminary Assessment.

The onsite installation visit was conducted by HMTC from 13 June through 24 June 1988. The scope of this Preliminary Assessment is limited to the installation and includes:

- An onsite visit;
- The acquisition of pertinent information and records on hazardous materials use and hazardous wastes generation and disposal practices at the installation;
- The acquisition of available geological, hydrological, meteorological, land use, and critical habitat data from various Federal, State and local agencies;
- A review and analysis of all information obtained; and

- The preparation of a report to include recommendations for further actions, if warranted.

The onsite visit, records search, and interviews with Air Force personnel were conducted during the period 13 June to 24 June 1988. The Preliminary Assessment site visit was conducted by Mr. Dave Hale, Civil Engineer; Ms. Betsy Briggs, Hazardous Waste Specialist; Ms. Natasha Brock, Environmental Scientist; Mr. Lance Gladstone, Geophysicist; and Mr. Raymond Clark, P.E./Department Manager. Other HMTC personnel who assisted with the Preliminary Assessment included Mr. Mark Johnson, P.G./Program Manager; Ms. Grace Hill, Environmental Scientist; and Ms. Janet Emry, Hydrogeologist (Appendix A). Personnel from AAC who assisted in the Preliminary Assessment included Mr. James W. Hostman, Chief, Environmental Planning (HQ AAC/DEPV) and Mr. Jeffrey M. Ayres, Point of Contact (POC) (HQ AAC/DEPV).

E. Methodology

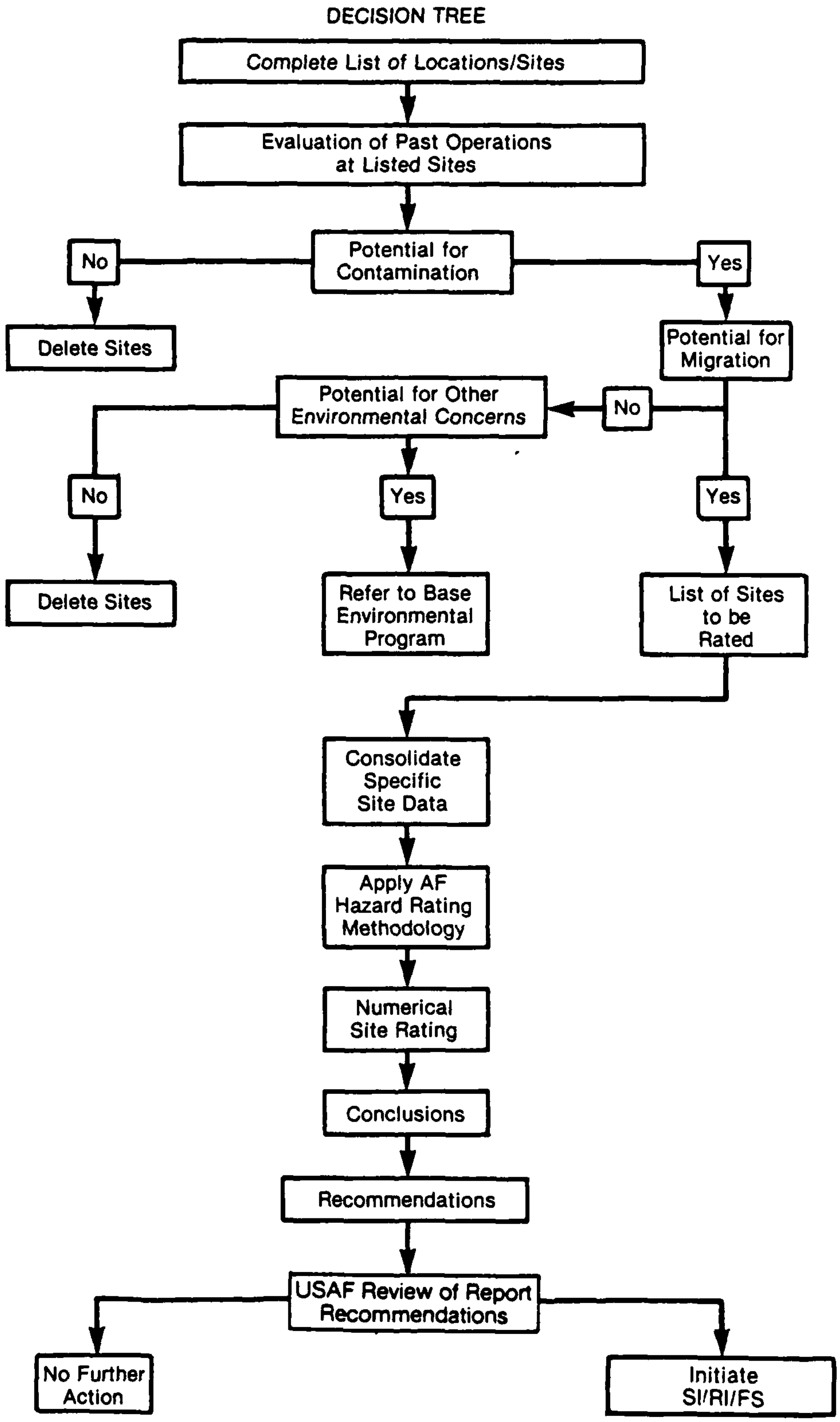
A flow chart of the Preliminary Assessment Methodology is presented in Figure 1. This Preliminary Assessment methodology ensures a comprehensive collection and review of pertinent site specific information, and is used in the identification and assessment of potentially contaminated hazardous waste spill/disposal sites.

The Preliminary Assessment begins with a site visit to the installation to identify all potential areas where contamination may have resulted from the use or disposal of HM/HW. Next, an evaluation of past HM/HW handling procedures at the identified locations is made to determine whether environmental contamination may have occurred. The evaluation of past HM/HW handling practices is facilitated by extensive interviews with Air Force personnel familiar with the various past operating procedures at the installation. The interviews also define the areas on the installation where any waste materials, either intentionally or inadvertently, may have been used, spilled, stored, disposed of, or released into the environment.

HMTC PRELIMINARY ASSESSMENT
INSTALLATION
RESTORATION PROGRAM

Figure 1.

Preliminary Assessment Methodology Flow Chart.



Historical records are collected and reviewed to supplement the information obtained from interviews. Using the information outlined above, a list of past waste spill/disposal sites on the installation is identified for further evaluation. A general survey tour of the identified spill/disposal sites, the installation, and the surrounding area is conducted to determine the presence of visible contamination and to help assess the potential for contaminant migration. Particular attention is given to locating nearby drainage ditches, surface water bodies, residences, and wells.

Detailed geological, hydrological, meteorological, land use, and environmental data for the area of study is also obtained from the POC and from appropriate Federal, State and local agencies. A list of outside agencies contacted is in Appendix B. Following a detailed analysis of all the information obtained, sites are identified as suspect areas where HM/HW disposal may have occurred. Evidence at these sites suggests that they may be contaminated and that the potential for contaminant migration exists. Where sufficient information is available, sites are assigned a Hazard Assessment Score (HAS) using the U.S. Air Force Hazard Assessment Rating Methodology (HARM) (Appendix C). However, the absence of a HAS does not necessarily negate a recommendation for further IRP investigation, but rather may indicate a lack of data. The HAS for each site is computed from the HARM guidelines and the data included in the Factor Rating Criteria (Appendix D).

II. INSTALLATION DESCRIPTION

A. Location

Naknek Recreational Camps are located at the north end of the Alaskan Peninsula on the north shore of the Naknek River. Camp I is located approximately four miles southeast of the King Salmon Airport, along the banks of the Naknek River. Its location is Section 4, Township 18 South, Range 44 West, Seward Meridian. Camp II is located approximately six miles east of the King Salmon Airport, along the banks of the Naknek Lake. Its location is Section 25, Township 17 South, Range 44 West, Seward Meridian. The locations of Naknek Camp I and Camp II are shown in Figure 2.

Although the camps are between four and six miles from the airport and surrounding town, there are no inhabitants within 1 mile of the facilities.

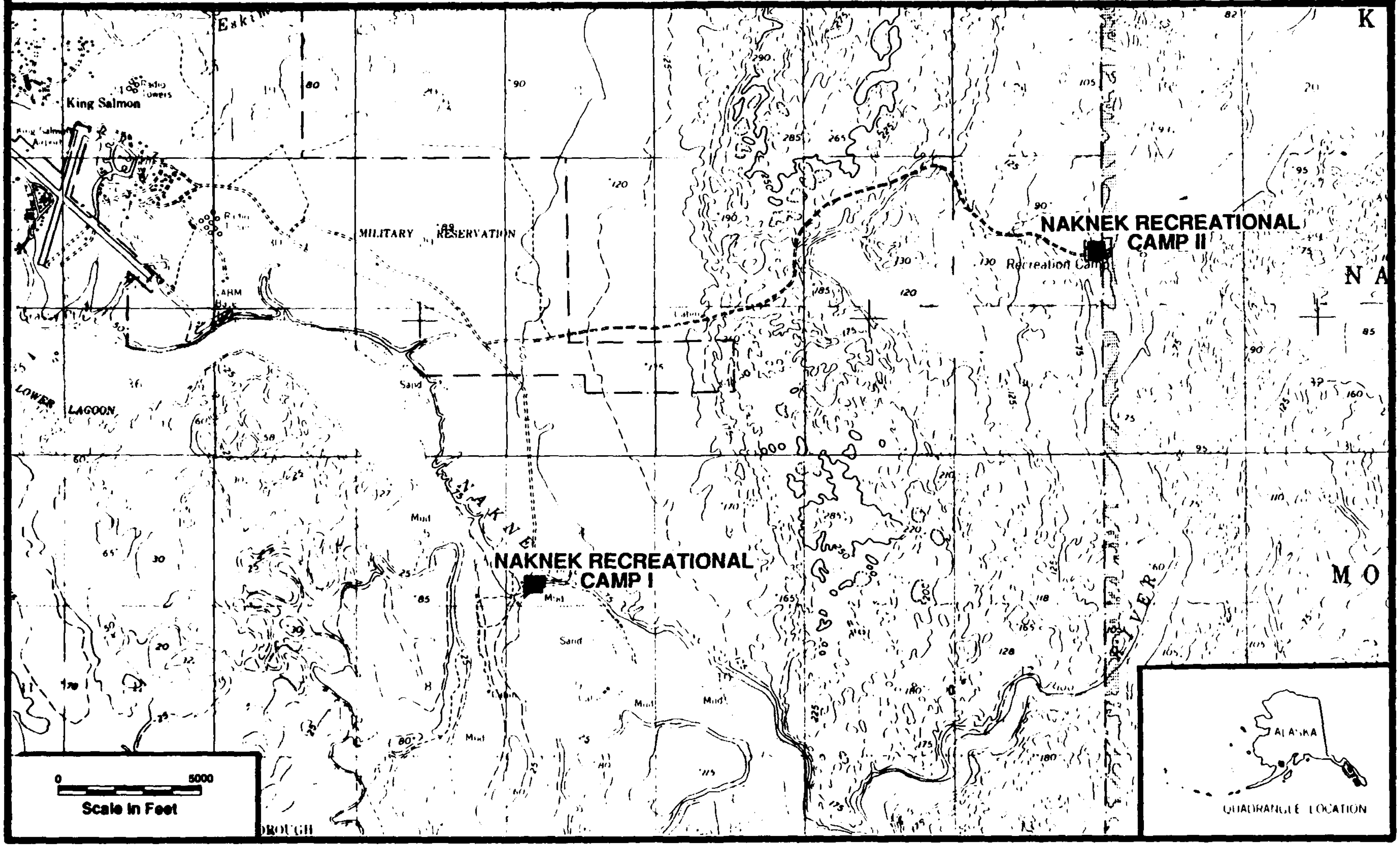
B. History

Naknek Camp I (Rapids Camp) is a former fishing and camping recreational facility used by the Air Force between 1956 and 1977. At that time, the facility contained semipermanent structures and equipment to support these recreational activities. The site originally contained several medium-sized quonset-type structures and an undetermined number and type of smaller ancillary structures.

The Declaration of Excess Real Property prepared by the Air Force lists one lodging building, one recreation building, three support buildings, utility lines, roads, fuel storage tanks and water tanks as improvements on this parcel. The Department of the Army, Corps of Engineers submitted a notice of intent to relinquish these land on 16 June 1977. A letter from the Corps of Engineers to Bureau of Land Management (BLM) states that the land is not known to be contaminated with explosives or toxic materials, and therefore, no decontamination is necessary.

Source: U.S.G.S. Naknek (C-2)
Quadrangle, Alaska, 7.5 Minute
Series Topographic Map, 1973.

Figure 2.
Location of Naknek Recreation Camps I and II, Alaska.



An investigation of Naknek Camp I was conducted by BLM on 25 September 1987. At that time, the only remaining improvements on the property were three quonset huts which were in very deteriorated condition. Approximately 25 55-gallon drums were found on the bank of Naknek River and at the top of the bluff where the recreational and lodging buildings were once located. The bluff area had been razed and the improvements either buried on site or removed. Some broken metal pipes were found in this area, one appeared to have been a water pipe, the other pipe's original use was uncertain.

Naknek Camp II (Lake Camp) was also used as a fishing, hunting, and recreational facility with several semipermanent facilities. In 1956, Camp II, consisting of approximately 11.5 acres, was withdrawn by Public Land Order (PLO) as an Air Force recreation area. In 1956, the PLO was amended by presidential proclamation, and about four acres of the withdrawn land were made a part of the Katmai National Monument. Subsequently, the Air Force acquired a no-cost permit from the National Park Service (NPS) for use of these four acres. The Air Force needed this property to protect existing improvements consisting of a waste treatment building and a boat storage building, and to allow access to the float dock in the river.

The Air Force continued to operate the recreation camp until 1976, using the four acres of land permitted from NPS, in addition to the 7.5 acres remaining under the original PLO. Due to external pressures, AAC declared the recreation area excess to Air Force needs. The Armed Services Committee approved disposal of the 7.5 acres and accompanying improvements on 6 April 1977. However, the Recreation Lodge and Recreation Building were destroyed by fire in 1978. NPS terminated the permit for the four acres after the Air Force cleaned up the site and restored the area in 1979.

Currently, the only structures remaining on the site are two steel quonset huts in poor condition. The larger, and southernmost, of these buildings borders on the southern end of the site. The second building is closer to the lake, and somewhat smaller. Several smaller concrete foundations for other buildings or structures are also apparent in this area.

III. ENVIRONMENTAL SETTING

A. Meteorology

Naknek, Alaska is located at the north end of the Alaskan Peninsula on the north shore of the Naknek River. Because this area borders the Bering Sea, it has a cold maritime climate, which is characterized by only moderate diurnal and annual temperature ranges and by the occurrence of maximum and minimum temperatures longer after the summer and winter solstices, respectively, than in a continental climate.

Temperature ranges from above 70°F in summer to minimum temperatures below 0°F in the winter. Annual precipitation averages 22.89 inches, with maximum precipitation occurring in late summer and autumn, and the driest period is in early spring (Patric and Black, 1968). Maximum rainfall intensity at Naknek, based on a 10-year, 24-hour rainfall, is 2 inches (Miller, 1963). Net precipitation is calculated by substracting the mean annual lake evaporation from the annual precipitation (47 FR 31227). Since the mean annual lake evaporation is not available for this portion of Alaska, an estimated annual potential evapotranspiration rate was used (NOAA, personal communication, 1988). The annual potential evapotranspiration rate is 18.66 inches per year (Patric and Black, 1968), therefore, the annual net precipitation is 4.23 inches.

B. Geology and Soils

The Naknek area consists mostly of low moraine hills with many shallow lakes. Natural erosion has drained some of these lakes, and only the beds remain. A high terrace borders much of the Naknek River, with an escarpment ranging between 50 and 100 feet in height. In some places, sand dunes occur above the escarpment; these are generally fully vegetated and stabilized (Furbush and Wiedenfeld, 1968).

Camp I is located on the terrace and steep escarpment north of the Naknek River, and on the narrow flood plain adjacent to the river. The terrace and

escarpment are composed of unconsolidated glacial outwash deposits of Pleistocene age; the flood plain is composed of unconsolidated Recent fluvial deposits. Materials beneath Camp I are composed primarily of alluvial sand and silt deposits. Most of the King Salmon-Naknek area is mantled with a thin layer of volcanic ash. Camp II is also located on the terrace and escarpment west of the Naknek River (Beikman, 1974) near the mouth to Naknek Lake. This terrace overlies morainal deposits of the Iliamna Stade and is composed of thick sand deposits. Figure 3 illustrates the distribution of these units at the land surface.

In the King Salmon area, well logs indicate that sand, with minor amounts of gravel and clay, predominates in the first 40 to 100 feet from the land surface. The sand is generally underlain by up to 40 feet of clayey material, presumably a glacial till. These deposits are underlain by interbedded clays, silts, sands, and gravels to depths of at least 250 feet (Feulner, 1963).

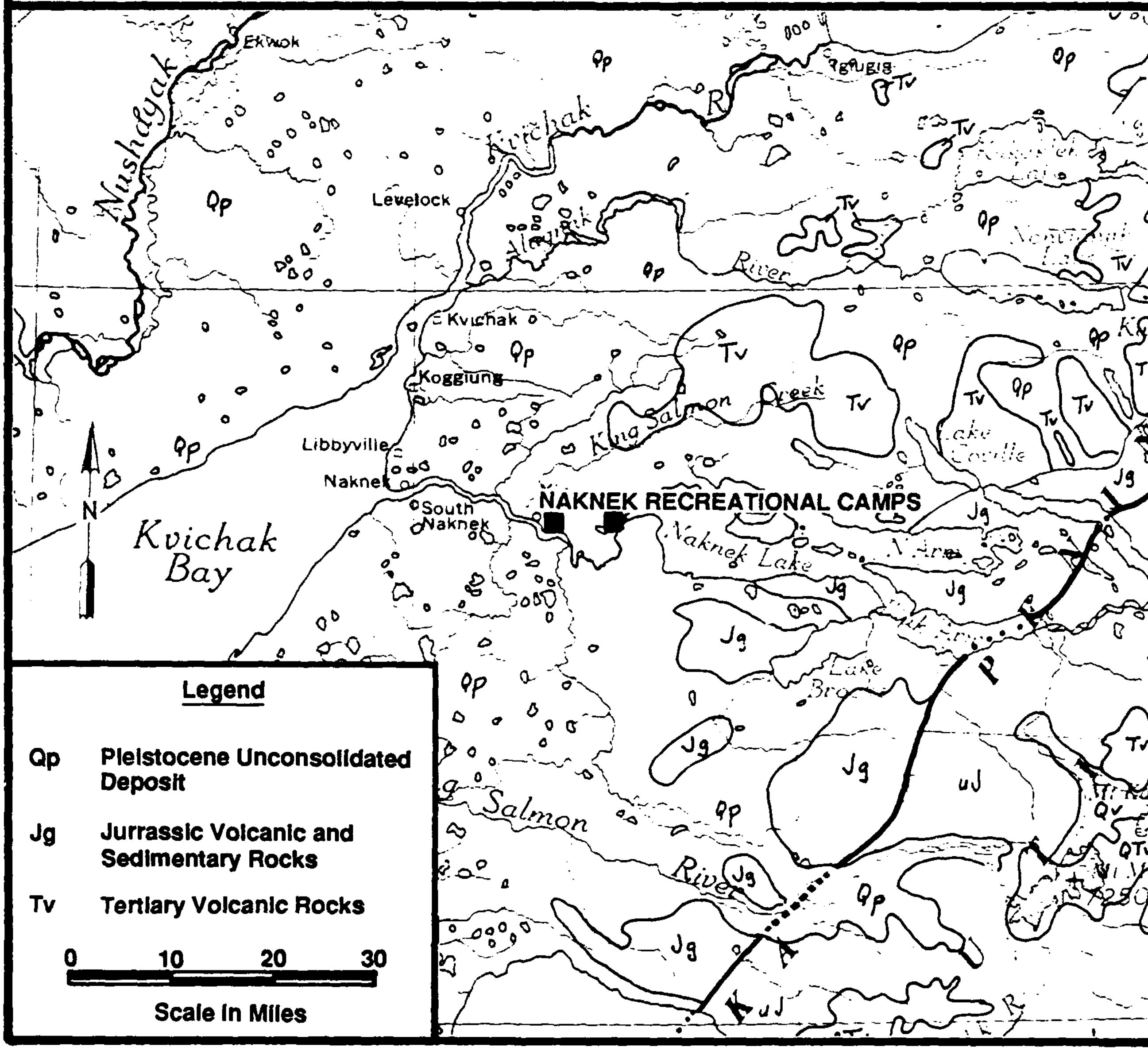
The Quaternary sediments are primarily underlain by coal-bearing sandstones and shales of Mesozoic (?) age. Outcrops of Tertiary volcanic rocks, including basalt and andesite flows, and Jurassic quartz diorite and granodiorite plutons also occur in the Naknek area (Beikman, 1974; Univ. of Alaska, 1982).

According to the U.S. Soil Conservation Service, the soils at Camps I and II consist of the Typic Cryandepts-Histic Pergelic Cryaquepts complex (Reiger and others, 1979). The permeability of the soils adjacent to the Naknek River is usually moderate, from 5 to 10 inches per hour (3.5×10^{-3} to 7.1×10^{-3} cm/sec) (Furbush and Wiedenfeld, 1968).

Typic Cryandepts, sandy, nearly level to rolling, are well drained soils that consist of sand volcanic ash. They occur on low ridges, knolls, and stabilized dunes on broad terraces. Elevations range from about sea level to about 1,000 feet. The soils, under a thin surface mat of organic matter with ash lenses, consist of dark reddish brown, dark brown, and dark grayish brown layers of sandy volcanic ash.

Source: U.S.G.S. Miscellaneous Field Studies Map MF-611, Sheet 1 of 2.

Figure 3.
Geology of the Region Surrounding Kvichak Bay, Alaska.



Histic Pergelic Cryaquepts, sandy, nearly level to rolling, are poorly drained soils with permafrost in broad drainageways, in slight depressions, and on long smooth slopes. These soils have a thick peaty surface mat over dark mottled volcanic ash with a gray substratum. The permafrost table is 10 to 20 inches deep.

Fluvaquentic Cryofibrists, nearly level, are poorly drained fibrous organic soils in depressions in the outwash plains. These soils consist of deep fibrous sedge peat with seams and patches of sandy volcanic ash.

C. Hydrology

Surface Water

The Naknek River flows westward from Naknek Lake to its outfall into Bristol Bay, near the town of Naknek. The water from the lake and river are not used for drinking water, but provide a habitat for fish and wildlife. Because Camps I and II are situated on the bank of the Naknek River, surface runoff at these areas flows directly into the river. At Camp I, runoff flows south into Naknek River; at Camp II, runoff flows east into the lake.

Due to its elevation, the lower portion of Camp I is within the flood plain of the Naknek River; Camp II is beyond the flood plain of Naknek Lake.

Groundwater

In the Naknek area, abundant groundwater is found within the sandy surficial glacial outwash and alluvial deposits near the Naknek River. Shallow groundwater within this surficial aquifer discharges to the Naknek River and its tributaries. Wells within the surficial aquifer near King Salmon yield from as little as 5 gallons per minute (gpm) up to 100 gpm. Chemical quality of this groundwater is generally good, although sodium levels are quite variable. The water is typically soft and is alkaline in some localities, with pH ranging from 6.8 to 9.3 (Feulner, 1963).

The surficial aquifer is underlain, in at least some localities, by a clay layer which ranges from 3 to 40 feet in thickness. This clay may act as an aquitard, retarding the flow of shallow groundwater into the deeper sediments and rock formations. A well, located approximately 3,500 feet northeast of the Village of King Salmon is screened within a coarse sand unit beneath the clay and yields 140 gpm. This water is also of good quality. A well is located 2.3 miles to the north-northwest of Camp I (Feulner, 1963), and there are houses 1.5 to 2.0 miles west of Camp II that may have wells.

C. Critical Habitats/Endangered or Threatened Species

According to the Alaska Division of the U.S. Fish and Wildlife Service, there is no survey data available regarding threatened or endangered species for Naknek Camp I and Naknek Camp II. The area within a 1-mile radius of either camp is not a federally- or state-designated critical habitat.

The Katmai National Park and Preserve lies approximately 3.75 miles east of Naknek Camp I. Naknek Camp II lies within the park and preserve. The land on the other side of the Naknek River is designated as wilderness.

Although the Naknek area has not been mapped by the National Wetland Inventory, most of the land in the vicinity of Naknek Camp I and Camp II is believed to be wetlands by the U.S. Fish and Wildlife Service.

IV. FINDINGS

A. Activity Review

A review of AAC records and interviews with Air Force personnel resulted in the identification of activities at Naknek Camp I and Camp II in which the majority of HM/HW were disposed of onsite. These activities included two recreational camps that were used periodically as disposal areas.

B. Disposal/Spill Site Identification, Evaluation, and Hazard Assessment

Interviews with Air Force personnel and subsequent site inspections resulted in the identification of three sites potentially contaminated with HM/HW. The locations of these sites are indicated in Figures 4 and 5.

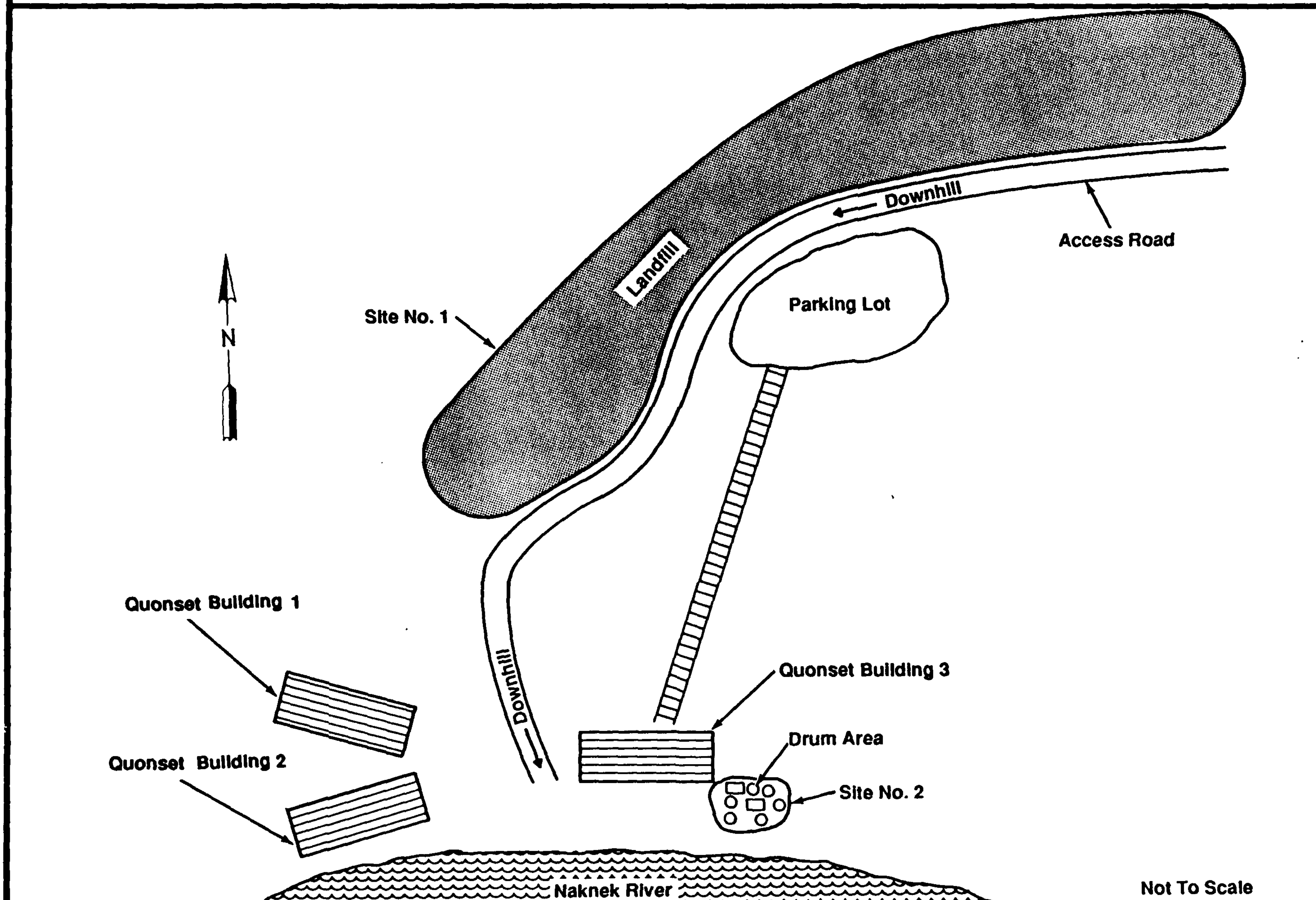
The three sites were assigned HAS scores according to HARM (Appendix C). Copies of the HARM guidelines, the Factor Rating Criteria, and the completed Hazardous Assessment Rating Forms are found in Appendix D. Table 1 summarizes the HAS for each of the scored sites. The objective of this assessment is to provide relative ranking of sites suspected of contamination from hazardous substances. The final rating score reflects specific components of the hazard posed by a specific site: possible receptors of the contaminating (e.g., population within a specified distance of the site and/or critical environments within a 1-mile radius of the site); the waste and its characteristics; and the potential pathways for contaminant migration (e.g., surface water, groundwater, flooding). Brief descriptions of all the sites follow.

Site No. 1 - Camp I-Landfill (HAS-57)

A suspected area located on the left side of the access road (facing north) and adjacent to a parking lot appeared to be a construction rubble landfill. The area includes the top of the bluff to the bottom of the hill. The area

Source: HMTC, 1988.

Figure 4.
Map of Identified IRP Sites
Naknek Camp 1, Alaska



HMTC Source: HMTC, 1988.

Figure 5.
Map of Identified IRP Sites
Naknek Camp II, Alaska

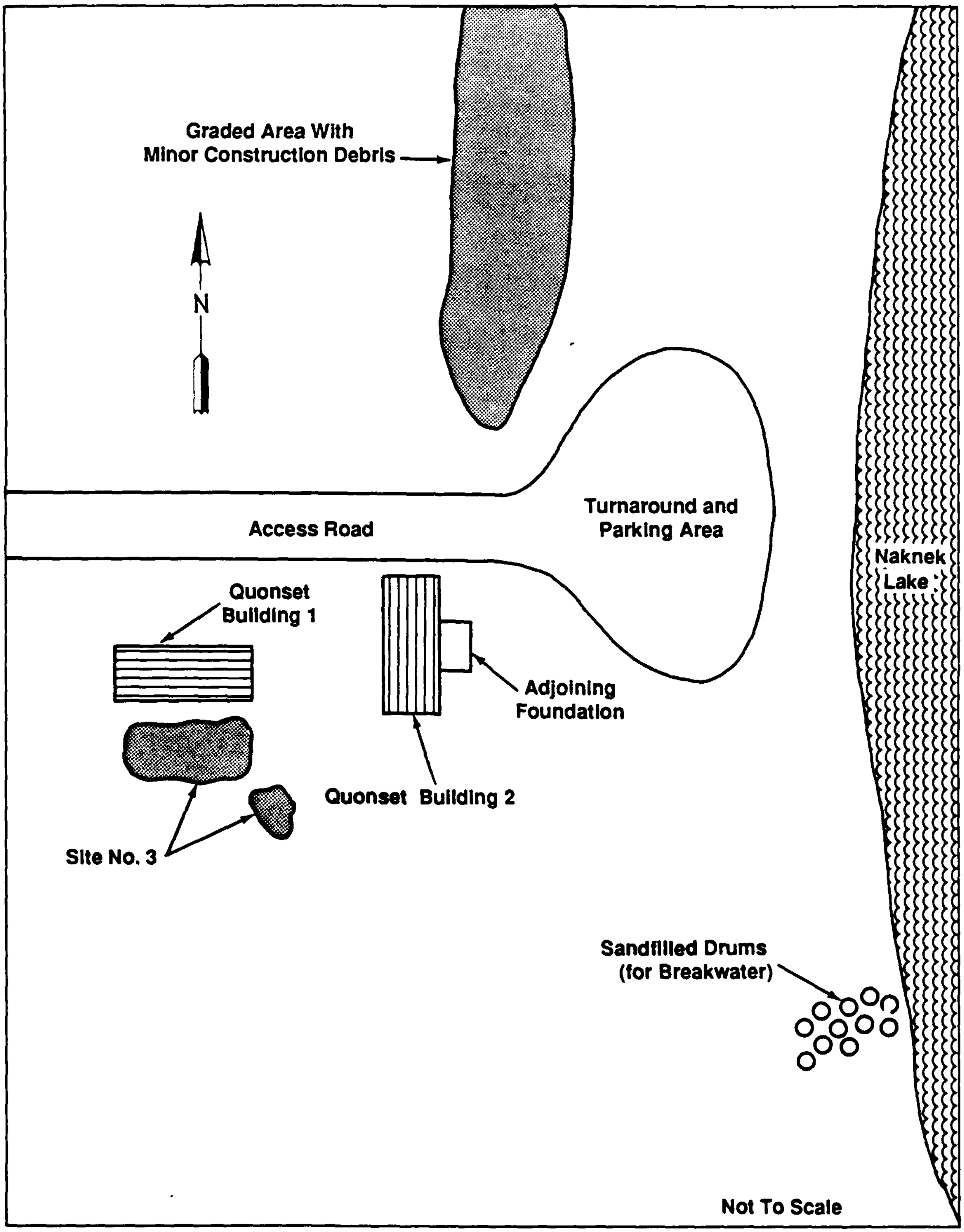


Table 1. Site Hazard Assessment Scores (as derived from HARM): Naknek Recreational Camps, Alaska

Site Priority	Site No.	Site Description	Receptors	Waste Characteristics	Pathway	Waste Mgmt. Practices	Overall Score
1	1	Camp I - Landfill	42	50	80	1.0	57
2	2	Camp I - Partially Buried Drums	42	40	80	1.0	54
3	3	Camp II - Stained Areas	42	40	80	1.0	54

is approximately 50 yards by 200 yards. The heavy foliage made it difficult for the hill to be viewed as a whole (see Photo 1, Appendix E). At the top of the bluff, it appeared that substantial oil or fuel dumping activities had occurred because of stained soil in the area. In this area, a photo-ionization detector (PID) survey gave relatively high readings (approximately 20 ppm) (see Photos 2 and 3, Appendix E). Approximately 25 55-gallon drums were found on the hillside, along with a relatively new glycol barrel that had been punctured (see Photos 4, 5, and 6, Appendix E). At the bottom of the hill were large pieces of steel used for construction (see Photos 7 and 8, Appendix E).

Site No. 2 - Camp I-Partially Buried Drums (HAS-54)

An area behind quonset hut 3 (located on the left side of the access road heading south) is where six or more drums were found. These drums were partially buried in a mound of dirt. Construction rubble was also buried with the drums (see Photo 9, Appendix E). One drum was marked "JP-4", another with its bottom bulged. Several of the drums were labeled in Air Force Inventory markings, and originally contained JP-4 aircraft fuel.

Site No. 3 - Camp II-Stained Areas (HAS-54)

Two stained areas were found on the west side of the first quonset building, south of the access road. The larger stained area, approximately 20 feet by 15 feet, was directly adjacent to the building (see Photo 10, Appendix E). A smaller stained area located 50 yards southeast of the first stained area was also found. This area was surveyed with the PID, giving negative results (see Photo 11, Appendix E).

C. Other Pertinent Information

A graded area with some minor construction debris was observed north of the access road at Camp II. This area was cleaned up when the 5099th Civil Engineering Operation Squadron (CEOS) visited the site (see Photo 12, Appendix E).

V. CONCLUSIONS

Information obtained through interviews with Air Force Personnel, review of installation records, and field observations indicates that hazardous wastes have been disposed of or spilled on the Naknek Camp I and II property. As a result, three potentially contaminated disposal and/or spill sites have been identified. These sites consist of the following:

- Site No. 1 - Camp I-Landfill (HAS-57),
- Site No. 2 - Camp I-Partially Buried Drums (HAS-54), and
- Site No. 3 - Camp II-Stained Areas (HAS-54).

Each of these sites is potentially contaminated with HM/HW and each exhibits the potential for contaminant migration to groundwater and surface water. Therefore, these sites were assigned a HAS according to HARM.

VI. RECOMMENDATIONS

A Site Investigation, consisting of a limited monitoring program, is recommended to confirm the presence or absence of hazardous contaminants. The priority for monitoring at Naknek Camp I and II is considered moderate, since no imminent hazard has been determined.

Site No. 1 - Camp I-Landfill

For the Camp I-Landfill, it is recommended that the construction rubble, drums, and barrels be removed. In order to ascertain the extent of the contamination, soil sampling should be conducted and the contaminated soil removed and properly disposed of in accordance with applicable regulations. A groundwater monitoring well system should also be considered, pending the results of the soil sampling, to confirm any contaminant migration.

Site No. 2 - Camp II-Partially Buried Drums

Removal is recommended for all drums. In order to ascertain the extent of the contamination, soil sampling should be conducted and the contaminated soil removed and disposed of properly in accordance with applicable regulations. If the soil proves to be contaminated, a groundwater monitoring well system should also be considered to confirm any contaminant migration.

Site No. 3 - Camp II-Stained Area

Soil sampling is recommended for each of the stained areas to ascertain the extent of soil contamination. The contaminated soil should be removed and disposed of in accordance with applicable regulations.

The presence of unidentified drums, disturbed pipelines, previous existence of fuel tanks, and lack of any records regarding the clean up activities that have taken place indicate that these parcels require additional evaluation for the presence of hazardous waste.

GLOSSARY OF TERMS

ALKALINE - Having a pH greater than 7.

ALLUVIAL - Pertaining to or composed of alluvium, or deposited by a stream or running water; e.g., an "alluvial clay" or an "alluvial divide."

ANDESITE - A dark-colored, fine-grained extrusive (volcanic) rock composed primarily of the minerals feldspar, biotite, hornblende, and pyroxene.

ANNUAL PRECIPITATION - The total amount of rainfall and snowfall for the year.

AQUIFER - A geologic formation, or group of formations, that contains sufficient saturated permeable material to conduct groundwater and to yield economically significant quantities of groundwater to wells and springs.

AQUITARD - A confining bed that retards but does not prevent the flow of water to or from an adjacent aquifer.

ASH - Pulverized particulate matter ejacted by volcanic eruption.

BANK - A steep slope or face, as on a hillside, usually of sand, gravel or other unconsolidated material.

BASALT - A general term for dark-colored mafic igneous rock.

BASIN - (a) A depressed area with no surface outlet; (b) A drainage basin or river basin; (c) A low area in the Earth's crust, of tectonic origin, in which sediments have accumulated.

BED (lake) - The ground upon which any body of water rests, or the land covered by the waters of a stream, lake, or ocean.

CLAY [soil] - A rock or mineral particle in the soil having a diameter less than 0.002 mm (2 microns).

CLAY [geol] - A rock or mineral fragment or a detrital particle of any composition smaller than a fine silt grain, having a diameter less than 0.004 mm.

COAL - A readily combustible rock containing more than 50% by weight and more than 70% by volume of carbonaceous material including inherent moisture, formed from compaction and induration of variously altered plant remains similar to those in peat.

COARSE-GRAINED - Said of a soil or sediment in which gravel and/or sand predominates.

CRITICAL HABITAT [Fed] - The specific areas within the geographical area occupied by the species, at the time it is listed in accordance with the provisions of section 4 of the Endangered Species Act, on which are found those physical or biological features (I) essential to the conservation of the species and (II)

which may require special management consideration or protection; and specific areas outside the geographical area occupied by the species at the time it is listed in accordance with the provisions of section 4 of the Endangered Species Act, upon a determination by the Secretary that such areas are essential for the conservation of the species.

CRITICAL HABITAT [Alaska] - Places where protective emphasis is on the environment in which wildlife occurs. Critical habitats may be complete biotic systems -- identifiable environmental units that operate as self-sustaining systems -- or well-defined areas specifically needed by wildlife for certain functions such as nesting or spawning.

DEPOSITS - Earth material of any type, either consolidated or unconsolidated, that has accumulated by some natural process or agent.

DIORITE - A group of igneous rocks composed of dark-colored amphibole (esp. hornblende) oligoclase, andesine, pyroxene, and small amounts of quartz; the intrusive equivalent of andesite.

DISCHARGE - The release of any waste stream or any constituent thereof to the environment which is not covered.

DRAINAGEWAY - A channel or course along which water moves in draining an area.

ENDANGERED SPECIES - Any species which is in danger of extinction throughout all or a significant portion of its range other than a species of the Class Insecta determined by the Secretary to constitute a pest whose protection under the provisions of the Endangered Species Act would present an overwhelming and overriding risk to man.

EROSION - The general process or the group of processes whereby the materials of the Earth's crust are loosened, dissolved, or worn away, and simultaneously moved from one place to another by natural agencies, but usually exclude mass wasting.

ESCARPMENT - A long, more or less continuous cliff or relatively steep slope facing in one general direction, breaking the continuity of the land by separating two level or gently sloping surfaces, and produced by erosion or by faulting.

FIBROUS - Having, composed of, or like fibers.

FLOOD PLAIN - The surface or strip of relatively smooth land adjacent to a river channel, constructed by the present river in its existing regimen and covered with water when the river overflows its banks.

FLUVIAL - Produced by the action of a stream or river.

FORMATION - A lithologically distinctive, mappable body of rock.

GLACIAL - (a) Of or relating to the presence and activities of ice or glaciers, (b) Pertaining to distinctive features and materials produced or derived from glaciers and ice sheets.

GLACIAL TILL - See TILL.

GRANODIORITE - A group of coarse-grained plutonic rocks intermediate in composition between quartz diorite and quartz monzorite, containing quartz, plagioclase, and potassium feldspar with biotite, horneblende, or more rarely, pyroxene, as the mafic contents.

GRAVEL - An unconsolidated, natural accumulation of rounded rock fragments resulting from erosion, consisting predominantly of particles larger than sand, such as boulders, cobbles, pebbles, granules or any combination of these fragments.

GROUNDWATER - Refers to the subsurface water that occurs beneath the water table in soils and geologic formations that are fully saturated.

HARM - Hazard Assessment Rating Methodology - A system adopted and used by the United States Air Force to develop and maintain a priority listing of potentially contaminated sites on installations and facilities for remedial action based on potential hazard to public health, welfare, and environmental impacts. (Reference: DEQPPM 81-5, 11 December 1981.)

HAS - Hazard Assessment Score - The score developed by using the Hazardous Assessment Rating Methodology (HARM).

HAZARDOUS MATERIAL - Any substance or mixture of substances having properties capable of producing adverse effects on the health and safety of the human being. Specific regulatory definitions also found in OSHA and DOT rules.

HAZARDOUS WASTE - A solid or liquid waste that, because of its quantity, concentration, or physical, chemical, or infectious characteristics may:

a. cause, or significantly contribute to, an increase in mortality or an increase in serious or incapacitating reversible illness, or

b. pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed of, or otherwise managed.

HILL - A natural elevation of the land surface, rising rather prominently above the surrounding land, usually of limited extent and having a well defined outline (rounded) and generally considered to be less than 1,000 feet from base to summit.

IGNEOUS ROCKS - Rock or mineral that has solidified from molten or partially molten material, i.e. from a magma.

IMPERVIOUS - Incapable of being passed through, as by moisture or light rays; impenetrable.

INTERBEDDED - Beds lying between or alternating with others of different character; especially rock material laid down in sequence between other beds.

JURASSIC - The second period of the Mesozoic (after the Triassic and before the Cretaceous) from 190 to 135 million years ago.

KNOLL - A small, low, rounded hill.

LAKE - Any inland body of standing water occupying a depression in the Earth's surface, generally of appreciable size (larger than a pond) and too deep to allow land plants to take root across the expanse of water.

LENS - A geologic deposit bounded by converging surfaces (at least one of which is curved), thick in the middle and thinning out toward the edges, resembling a convex lens. A lens may be double-convex or plano-convex.

MANTLE - A general term for an outer covering of material of one kind or another.

MARINE - Of, pertaining to, or characteristic of the sea.

MARITIME [climate] - Bordering on the sea, as a amritime province; marine climate.

MESOZOIC - An era of geologic time, from the end of the Paleozoic to the beginning of the Cenozoic, or from about 225 to about 65 million years ago.

MORAINAL - Relating to, forming, or formed by a moraine.

MORAINE - A mound, ridge, or other distinct accumulation of unsorted, unstratified glacial drift, predominantly till, deposited chiefly by direct action of glacier ice, in a variety of topographic landforms that are independent of control by the surface on which the drift lies.

NATURAL AREA - An area of land or water that has retained its wilderness character, although not necessarily completely natural and undisturbed, or that has rare or vanishing flora, fauna, archaeological, scenic, historical, or similar features of scientific or educational value.

NET PRECIPITATION - Precipitation minus evaporation.

OUTWASH - A stratified detritus (chiefly sand and gravel) removed or "washed out" from a glacier by meltwater streams and deposited in front of or beyond the end moraine or the margin of an active glacier.

PARK - An area of public land known for its natural scenery and preserved for public recreation by a State or national government.

PEAT - An unconsolidated deposit of semicarbonized plant remains in a water-saturated environment and of persistently high moisture content (at least 75%).

PERMAFROST - Rock or soil material that has remained below 0°C continuously for two or more years. Permafrost is defined solely on the basis of temperature.

PERMEABILITY - The capacity of a porous rock, sediment, or soil for transmitting a fluid without impairment of the structure of the medium; it is a measure of the relative ease of fluid flow under unequal pressure.

pH - A measure of the acidity or alkalinity of a solution.

PLUTON - Pertaining to igneous rocks formed at great depth.

POTENTIAL EVAPOTRANSPIRATION - Denoting possibility, capability, to lose water from a land area through transpiration of plants and evaporation from the soil.

PRESERVE - An area maintained and protected especially for regulated hunting and fishing.

PRISTINE - Something that is still pure or untouched; uncorrupted; unspoiled.

QUARTZ - A crystalline silica, an important rock forming mineral: SiO_2. Occurs either in transparent hexagonal crystals (colorless or colored by impurities or in crystalline. Forms the major proportion of most sands and has a widespread distribution in igneous, metamorphic and sedimentary rocks.

QUATERNARY - The second period of the Cenozoic era, following the Tertiary: it began 3 to 2 million years ago and extends to the present.

RAINFALL INTENSITY - The quantity of water that is precipitated out in the atmosphere as rain, in a given period of time with great concentration, power, or force.

RECENT - An epoch of the Quaternary period which covers the span of time from the end of the Pleistocene epoch, approximately 8 thousand years ago, to the present. Also called the Holocene epoch.

RECHARGE AREA - An area in which water is absorbed that eventually reaches the zone of saturation in one or more aquifers.

RIDGE - A general term for a long, narrow elevation of the Earth's surface, usually sharp-crested with steep sides, occurring either independently or as part of a larger mountain or hill.

RIVER - A general term for a natural freshwater surface stream of considerable volume and a permanent or seasonal flow, moving in a definite channel toward a sea, lake, or another river.

ROCK - An aggregate of one or more minerals; or a body of undifferentiated mineral matter or of solid organic material.

SAND - A rock or mineral particle in the soil, having a diameter in the range 0.52 - 2 mm.

SAND DUNE - An accumulation of loose sand heaped up by the wind, commonly found along low-lying seashores above high-tide level, more rarely on the border of

large lakes or rivers, valleys, as well as in various desert regions, where there is abundant dry surface sand during some part of the year.

SANDSTONE - A medium-grained fragmented sedimentary rock composed of abundant round or angular fragments of sand, size set in a fine-grained matrix (silt or clay) and more or less firmly united by a cementing material (commonly silica, iron oxide, or calcium carbonate).

SEDIMENT - (a) Solid fragmental material that originates from weathering of rocks and is transported or deposited by air, water, or ice, or that accumulates by other natural agents, such as chemical precipitation from solution or secretion by organisms, and that forms in layers on the Earth's surface at ordinary temperatures in a loose, unconsolidated form; (b) strictly solid material that has settled down from a state of suspension in a liquid.

SHALE - A fine-grained detrital sedimentary rock, formed by the consolidation (especially by compression) of clay, silt, or mud.

SILT [geol] - A rock fragment or detrital particle smaller than a very fine sand grain and larger than coarse clay, having a diameter in the range of 0.004 to 0.063 mm.

SILT [soil] - (a) A rock or mineral particle in the soil, having a diameter in the range 0.002-0.005 mm; (b) A soil containing more than 80% silt-size particles, less than 12% clay, and less than 20% sand.

SLOPE - (a) Gradient; (b) The inclined surface of any part of the Earth's surface.

SODIUM - A soft, light, extremely malleable sliver-white metallic element, used in the production of a wide variety of industrially important compounds.

SOIL PERMEABILITY - The characteristic of the soil that enables water to move downward through the profile. Permeability is measured as to the number of inches per hour that water moves downward through the saturated soil.

Terms describing permeability are:

Very Slow	- less than 0.06 inches per hour (less than 4.24×10^{-5} cm/sec)
Slow	- 0.06 to 0.20 inches per hour (4.24×10^{-5} to 1.41×10^{-4} cm/sec)
Moderately Slow	- 0.20 to 0.63 inches per hour (1.41×10^{-4} to 4.45×10^{-4} cm/sec)
Moderate	- 0.63 to 2.00 inches per hour (4.45×10^{-4} to 1.41×10^{-3} cm/sec)

Moderately Rapid	- 2.00 to 6.00 inches per hour (1.41×10^{-3} to 4.24×10^{-3} cm/sec)
Rapid	- 6.00 to 20.00 inches per hour (4.24×10^{-3} to 1.41×10^{-2} cm/sec)
Very Rapid	- more than 20.00 inches per hour (more than 1.41×10^{-2} cm/sec)

(Reference: U.S.D.A. Soil Conservation Service)

SOIL REACTION - The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests at pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as:

	pH
Extremely acid	Below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

SOIL STRUCTURE - The arrangement of primary soil particles into compound particles or aggregates that are separated from adjoining aggregates. The principal forms of soil structure are -- platty (laminated), prismatic (vertical axis of aggregates longer than horizontal), columnar (prisms with rounded tops), blocky (angular or subangular), and granular. Structureless soils are either single grained (each grain by itself, as in dune sand) or massive (the particles adhering without any regular cleavage, as in many hardpans).

STADE - A substage of a glacial stage marked by a glacial readvance.

SURFICIAL - Pertaining to, or occurring on, a surface, especially the surface of the Earth.

TERRACE - Any long, narrow, relatively level or gently inclined surface, generally less broad than a plain, bounded along one edge by a steeper descending slope and along the other by a steeper ascending slope.

TERTIARY - The first period of the Cenozoic era, thought to have covered the span of time between 65 and 3 to 2 million years ago.

THREATENED SPECIES - Any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

TILL - Dominantly unsorted and unstratified drift, generally unconsolidated, deposited directly by and underneath a glacier without subsequent reworking by meltwater, and consisting of a heterogenous mixture of clay, silt, sand and gravel and boulders ranging widely in size and shape

TRIBUTARY - A stream feeding, joining, or flowing into a larger stream or into a lake.

UNCONSOLIDATED MATERIAL - A sediment that is loosely arranged or whose particles are not cemented together, occuring either at the surface or at depth.

VOLCANIC - Igneous rocks that have reached the earth's surface before solidifying; generally finely crystalline or glassy.

VOLCANIC ASH - Fine pyroclastic material, under 2.0 mm diameter.

WETLANDS [EPA] - Marshes, swamps, bogs, and other low-lying areas, which during some period of the year will be covered in part by natural nonflood waters.

WETLANDS - Are lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. For purposes of the Classification of Wetlands and Deepwater Habitats of the United States, wetlands must have one or more of the following three attributes: (1) at least periodically , the land supports predominantly hydrophytes; (2) the substrate is predominantly undrained hydric soil; and (3) the substrate is nonsoil and is saturated with water or covered by shallow water at some time during the growing season of each year.

WILDERNESS AREA - An area where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain. An area of wilderness is further defined to mean in this chapter of the Wilderness Act, an area of underdeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions and which (1) generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable; (2) has outstanding opportunities for solitude or an primitive and unconfined type of recreation; (3) has at least 5,000 acres of land or is of sufficient size as to make practicable its preservation and use in an unimpaired condition; and (4) may also contain ecological, geological, or other features of scientific, educational, scenic or historical value.

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APPENDIX A

RESUMES OF PRELIMINARY ASSESSMENT TEAM MEMBERS

DAVID R. HALE

EDUCATION

B.S., Civil Engineering, Virginia Polytechnic Institute, 1978

SPECIALIZED TRAINING

Groundwater Remediation Course, National Water Well Association, 1986
Contract Supervisor School, CBI Industries, 1981

CERTIFICATION

Engineer-in-Training Certificate, State of Virginia, 1978

EXPERIENCE

Ten years' experience in a wide variety of engineering planning, design and management, environmental assessment and remediation, project and construction management, as well as research and development activities related to new and innovative technologies. Experience includes involvement in small-, medium- and large-scale environmental and civil projects, and includes project conception, design, implementation, construction and management activities. Extensive experience in the development, design and management of projects involving several interdisciplinary fields of engineering, sciences, and business. Proficiency in a wide variety of computer systems and usage, including mainframe and microcomputers as well as CAD systems.

EMPLOYMENT

Dynamac Corporation (1987-present): Manager of Engineering

Responsible for the engineering management of various environmental consulting engineering and technical services in the Dayton regional office. Responsibilities include the planning, development, and execution of engineering and technical services for environmental projects such as hazardous waste site investigations and remediation, asbestos assessment and abatement, RCRA permitting, monitoring and compliance, industrial hygiene and training, as well as other environmental matters.

DETOX, Inc. (1986): Manager, Technical Services

Responsible for the overall development, design, project management and implementation of various groundwater remediation projects, as well as several specialized wastewater treatment systems. Heavy emphasis on the conceptual development and design engineering related to innovative biological treatment techniques, equipment and systems, as well as multiunit process water and

wastewater treatment systems. Staff management responsibilities included supervision of engineering, procurement, and large-scale project management functions, as well as direct involvement in project marketing, corporate computer and CAD operations, and company R&D efforts.

DETOX, Inc. (1985-1986): Eastern Regional Manager

As regional manager for the eastern United States, responsibilities included the overall marketing, sales, and project management for groundwater remediation and industrial wastewater projects in this area. Efforts resulted in establishing a widespread customer interest base for the groundwater treatment equipment and technical services offered by DETOX, as well as sale and management of several substantial and innovative remediation projects. Instituted corporatewide microcomputer-based CAD and project management systems.

CBI Industries, Inc. (1981-1985): Project Engineer

As part of a new Water Technology Development venture group (1984-1985), involved in actively researching, seeking, and implementing for CBI new and innovative technologies and business lines. Responsibilities included acquisition research, engineering and financial analysis and assessment, market research, and business development. Two new business line developments resulted in $15 million to $20 million in annual revenues. Actively pursued several new business areas for CBI, including the privitization of municipal water and wastewater facilities, and sewage sludge composting. Initiated CBI interest in co-development of a new, innovative flue gas treatment technology for reducing acid-rain-causing emissions from fossil fuel combustion processes. Awarded one patent, with two pending applications, as a result of activities in the Water Technology group.

Project engineer assigned to various CBI Industries engineering departments (Special Structures, Standard Structures, and Marine Structures) (1981-1984); involved in the design and analysis of several substantial projects. These included the conception and design of two new and innovative offshore oil exploration drilling structures for use in Alaskan Arctic waters, with a patent award for one concept. Responsible for the external structural analysis and design on CBI's largest ever project, a turnkey LGN/LPG facility in excess of $350 million.

CBI Industries, Inc. (1979-1981): Project Engineer/Field Engineer

Assigned to CBI's Saudi Arabian construction subsidiary (Arabian CBI); worked as project and field engineer on several substantial field construction projects, including two refinery tankage terminals (a total of 120 petroleum tanks) and several refinery vessels and miscellaneous structures. Involved in the day-to-day management of large-scale field construction projects, including the close supervision and management of large numbers of field employees from several diverse nationalities. Responsible for the field engineering aspects of large petrochemical projects, including field layout, surveying, and erection supervision.

CBI Industries, Inc. (1978-1979): Engineer Trainee

Worked at CBI's Delaware Engineering Office and Pennsylvania Manufacturing Plant as part of CBI's Engineer Advancement Program. Duties included familiarization with CBI procedures related to detail engineering and manufacturing, as well as hands-on training in such areas as welding, fabrication, and engineering drawing.

PUBLICATIONS

Hale, D.R., and E.K. Nyer. 1986. Two Years of Operation of a Groundwater Treatment System, Proceedings of the 1986 ASCE National Conference on Environmental Engineering.

Hale, D.R., et al. Physical/chemical in-situ treatment techniques. Chapter 10 in: In-situ Treatment Technology (in press).

TECHNICAL PRESENTATIONS

Instructor on Groundwater Treatment Technology, 1986 Aquifer Remediation Course Series presented by the National Water Well Association

Instructor on Groundwater Treatment Technology, 1986 HazPro Professional Certification Symposium

LAWRENCE E. GLADSTONE

EDUCATION

B.S., Geophysics, Virginia Polytechnic Institute & State University, 1985

EXPERIENCE

Two years' experience as junior staff scientist for the Hazardous Materials Technical Center of Dynamac Corporation. Experience in hazardous waste management includes conducting Phase I records searches for the Air National Guard's Installation Restoration Program, auditing records of waste management firms awarded disposal contracts by DoD, and preparing RCRA Part B permit applications for the Defense Reutilization and Marketing Service (DRMS).

EMPLOYMENT

Dynamac Corporation (1986-present): Junior Staff Scientist

Performs preliminary assessments of suspected hazardous waste sites at Air National Guard bases under Phase I of the Installation Restoration Program. Duties include searching available records, interviewing past and present employees, observing current waste management practices, and investigating identified spill/disposal sites.

Prepares RCRA Part B permits for hazardous waste storage facilities operated by DRMS.

Prepared Air Force's response to EPA CERCLA 104(e) letters regarding wastes generated by Luke and Altus Air Force Bases which may have been disposed at landfill facilities subsequently identified as Superfund sites requiring remedial action.

Developed closure maintenance plans for landfill cells at Edwards Air Force Base.

Conducted surveillance of hazardous waste contractors for DRMS. Responsibilities included auditing waste records, tracking fate of disposed items, and monitoring contractor operations.

Assisted in development of data base designed to reveal disposal costs of waste generated at Defense Reutilization and Marketing Offices.

U.S. Geological Survey (part-time, 1983-1985): Cartographic Aide

Assisted in quality control process of printing and distributing 7-1/2 minute topographic maps. Checked and corrected map separate registration, organized negative and positive overlays for alignment, and prepared photographic service requests.

NATASHA M. BROCK

EDUCATION

Graduate work, civil/environmental engineering, University of Maryland, 1987-present

Graduate work, civil/environmental engineering, University of Delaware, 1985-1986

B.S. (cum laude), environmental science, University of the District of Columbia, 1984

Undergraduate work, biology, The American University, 1978-1980

CERTIFICATION

Health & Safety Training Level C

EXPERIENCE

Three years' experience in the environmental and hazardous waste field. Work performed includes remedial investigations/feasibility studies, RCRA facility assessments, comprehensive monitoring evaluations, and remedial facility investigations. Helped develop and test biological and chemical processes used in minimization of hazardous and sanitary waste generation. Researched multiple substrate degradation using aerobic and anaerobic organisms.

EMPLOYMENT

Dynamac Corporation (1987-present): Environmental Scientist

In working for Dynamac's Hazardous Materials Technical Center (HMTC), performs Preliminary Assessments, Remedial Investigations and Feasibility Studies (PA/RI/FS) under the Air National Guard Installation Restoration Program. Specifically involved in determining rates and extent of contamination, recommending groundwater monitoring procedures, and soil sampling and analysis procedures. In the process of preparing standard operating procedure manuals for quick remedial response to site spills and releases, and PA/RI/FS.

C.C. Johnson & Mulhotra, P.C. (1986-1987): Environmental Scientist

Involved as part of a team in performing Remedial Investigations/Feasibility Studies (RI/FS) for EPA Regions I and IV under Resource Conservation and Recovery Act (RCRA) work assignments for REM II projects. Participated on a team involved in RCRA Facility Assessments (RFAs), Comprehensive Monitoring Evaluations (CMEs), and Remedial Facility Investigations (RFIs) for EPA work assignments under RCRA for REM III projects in Regions I and IV. Work included solo oversight observations of field sampling and facility inspections. Additional responsibilities included promotion work, graphic layout, data entry-quality check for various projects. Certified Health & Safety Training Level C.

Work Force Temporary Services (1985-1986): Research Scientist

In working for DuPont's Engineering Test Center, helped in the development and testing of laboratory-scale biological and chemical processes for a division whose main purpose was to reduce the amount of hazardous waste generated. Also worked for Hercules, Inc., with a group involved in polymer use for wastewater treatment for clients in various industrial fields. Specifically involved in product consultation, troubleshooting, and product development.

National Oceanic and Atmospheric Administration (1982-1984): Research Assistant

Involved with an information gathering and distribution center of weather impacts worldwide. Specifically involved in data collection, distribution of data to clients, assessment production and special reports.

GRACE E. HILL

EDUCATION

B.S. (enrolled), Environmental Science, University of the District of Columbia
A.S., Marine Science, University of the District of Columbia, 1984

CERTIFICATION

Health & Safety Training Level C

EXPERIENCE

Seven years of experience in various environmental and hazardous waste disciplines including Preliminary Assessments, Remedial Investigations, and Feasibility Studies at Superfund sites, RCRA Facility Assessments, Initial Assessment Studies under the Naval Environmental Energy Study Assessment (NEESA), Region IV Compliance investigation for subsequent legal actions, Information Specialist for the EPA/Superfund Hotline, and assisting in the management of REM/FIT zone contracts.

Performed as task leader for the Blue Plains WWJP Biomonitoring Project consisting of laboratory setup, monitoring test organisms, conducting toxicity tests, and preparation of weekly and monthly reports.

EMPLOYMENT

Dynamac Corporation (1988-present): Environmental Scientist

In working for Dynamac's Hazardous Materials Technical Center (HMTC), performs Preliminary Assessments, Remedial Investigations, and Feasibility Studies (PA/RI/FS) under the Air National Guard Installation Restoration Program. Specifically involved in preparing reports detailing site investigation findings, determining rates and extent of contamination, and recommendations for Phase II monitoring and soil sampling.

Participated in a remedial investigation/feasibility study at a Superfund site in Puerto Rico to ascertain the alleged extent of mercury contamination.

C.C. Johnson & Malhotra, P.C. (1985-1988): Environmental Technician

Task leader for the Blue Plains WWTP Biomonitoring Project consisting of laboratory setup, monitoring test organisms, conducting toxicity tests, and preparation of weekly and monthly reports. Participated in groundwater monitoring, well installation and development at Independent Nail, SC, Superfund site. Conducted RCRA Facility Assessments (RFAs) under EPA's REM III Project for Regions I and IV. Performed literature search, site investigations, sample collection, CLP coordination, health and safety plan

preparation, data analysis, and document preparation. Participated on a team involved in the research and organization of compliance documents for subsequent legal actions. Participated in the preparation of an RI/FS consisting of surveying and soil, sediment, surface water and groundwater sampling, groundwater contamination migration determination, and residential well sampling at Geiger C&M Oil, SC, DeRewal, NJ, and Limestone Road, MD, Superfund sites. Assisted in the final preparation of the Initial Assessment Studies under the Navy's hazardous waste control program (NEESA) at three Navy facilities.

Geo/Resource Consultants (1984-1985): Environmental Assistant

Information Specialist for the EPA's RCRA/Superfund Hotline involved in technical assistance regarding federal and state regulations and the requirements necessary for the management of hazardous waste, for industry and the public.

Environmental Protection Agency (1981-1984): Intern

As an environmental intern, assisted Field Investigation Team (FIT) Deputy Project Officers in the management of REM/FIT zone contracts. Specifically involved in the evaluation of completed FIT projects, assistance in the award fee process, evaluation of FIT well drilling procedures, development of analytical documents for RCRA 3012 Cooperative Agreement Program, involving the development of a tracking system of the State agencies use of funds for hazardous waste cleanup.

BETSY A. BRIGGS

EDUCATION

B.S., Biology and Chemistry, State University College of New York at Cortland, 1979

Completed several courses in M.B.A. program, University of Phoenix, Denver, Colorado Division, 1984

SPECIALIZED TRAINING

Hazardous Waste Management course, Air Force Institute of Technology, 1986

CERTIFICATION

Certified Hazardous Materials Manager, Institute of Hazardous Materials Management, 1985

SECURITY CLEARANCE

Secret/DOE

EXPERIENCE

Nine years of experience including three years in hazardous waste management, two years as an environmental engineer, two years as an ecologist, and two years in laboratory research. Has conducted ambient air quality monitoring programs, critical pathways projects to study movement of radioactive materials in the environment, metallurgic laboratory analyses, and independent studies in biology and chemistry. Currently provides managerial oversight and technical support to a hazardous waste program for the Air Force.

EMPLOYMENT

Dynamac Corporation (1985-present): Program Manager/Hazardous Waste Specialist

Primary responsibility as program manager is to oversee and manage up to 44 field personnel involved in RCRA and CERCLA work in support of the U.S. Air Force. Other duties include performing preliminary assessments/site surveys for the Air National Guard, marketing and proposal preparation, and preparing and providing training in preparation for the Certified Hazardous Materials Manager examination.

As hazardous waste specialist the primary responsibility was to manage the hazardous waste program at Myrtle Beach Air Force Base. Duties included:

- o Reviewing the design and specifications of various base construction projects and overseeing such projects to ensure compliance with all applicable state and federal hazardous waste regulations. Projects under design included a corrosion control facility, TSD facility, two accumulation points, and a parts cleaning vat system. Construction project oversight included the final inspection of the entomology building to ensure that the facility was equipped for proper storage, usage and disposal of pesticides; removal of materials contaminated with pesticides, PCBs, petroleum products, and solvents from six sites; asbestos removal and disposal from a former hangar site; and the removal of two underground storage tanks, one of which was leaking.
- o Conducting surveys of hazardous waste generating activities.
- o Advising on need for and methods of minimizing hazardous waste generation.
- o Writing and maintaining hazardous waste management plan.
- o Preparing hazardous waste management reports and documents required by state and federal law.
- o Maintaining liaison with federal and state regulatory agencies on matters involving criteria, standards, performance specifications, and monitoring.
- o Providing information and technical consultation to Air Force installation staff regarding hazardous materials and hazardous waste operations.
- o Serving as ad hoc advisor to environmental contingency response teams.

<u>Rockwell International (1982-1984)</u>: Environmental Engineer

Primary responsibility was collection, evaluation, and reporting of ambient air monitoring data. Other responsibilities included technical assistance for monitoring total suspended solids in ambient air. Also performed data collection and reduction of air effluent emission control activities.

Environmental monitoring and control programs are to ensure that all Department of Energy and other governmental effluent regulations are met, and that plant effluents are consistent with the As Low As Reasonably Achievable (ALARA) Principle. Monthly and Annual Reports summarize the effluent and environmental monitoring programs.

<u>Rockwell International (1980-1982)</u>: Ecologist

Responsible for planning, organizing, and leading critical pathways projects designed to study the movement of radioactive materials throughout the environment. Projects were: (1) general critical pathway evaluation to identify

sampling points possibly not considered in present monitoring program; (2) plant uptake versus plant uptake plus foliar deposition measurement study; (3) deer tissue analysis program; and (4) food stuff monitoring program. Progress and results were published in semiannual reports.

Colorado School of Mines Research Institute, Texas Gulf Research Laboratory (1979-1980): Senior Laboratory Technician

Work involved quantitative analysis of platinum, palladium, and silver in soil samples. Analysis included sample preparation, fire assays, calorimetric procedures, and smelt tests.

State University College of New York at Cortland (1978-1979): Undergraduate Independent Study

Project involved the isolation of trail pheromone from spun silk of *Hyphantria* (fall webworm). Included organic and inorganic extraction procedures and performing bioassays. Also worked on production of synthetic diet comparable to fresh leaf diet for *Malacosomo* (eastern tent caterpillar).

PUBLICATIONS

Hazardous Waste Management Survey for Myrtle Beach Air Force Base, Hazardous Materials Technical Center, Rockville, Maryland, 1986 and 1988.

Hazardous Waste Management Plan for Myrtle Beach Air Force Base, Hazardous Materials Technical Center, Rockville, Maryland, 1987 and 1988.

Waste Minimization Guidance for Myrtle Beach Air Force Base, Hazardous Materials Technical Center, Rockville, Maryland, 1988.

Underground Storage Tank Management Plan for Myrtle Beach Air Force Base, Hazardous Materials Technical Center, Rockville, Maryland, 1988.

Annual Environmental Monitoring Report, Rockwell International, Energy Systems Group, Rocky Flats Plant, 1982 and 1983.

Environmental Studies Group Semiannual Report, Rockwell International, Energy Systems Group, Rocky Flats Plant, June/December of 1980 and 1981.

TECHNICAL PRESENTATIONS

PCB Management, Myrtle Beach Air Force Base, 1987.

Underground Storage Tank Regulations/History, Myrtle Beach Air Force Base, 1986.

Overview of the Hazardous Waste Training Program, Myrtle Beach Air Force Base, 1985.

Overview of the Environmental Studies Group, Nevada Test Site and Rockwell International at Hanford, Washington, 1981.

JANET SALYER EMRY

EDUCATION

M.S., geology, Old Dominion University, 1987
B.S. (cum laude), geology, James Madison University, 1983

EXPERIENCE

Three years' technical experience in the fields of hydrogeology and environmental science, including drilling and placement of wells, well monitoring, aquifer testing, determination of hydraulic properties, computer modeling of aquifer systems, and field and laboratory soils analysis.

EMPLOYMENT

Dynamac Corporation (1987-present): Staff Scientist/Hydrogeologist

Responsibilities include Preliminary Assessments, Site Investigations, Remedial Investigations, Feasibility Studies, and Emergency Responses to include providing geological and hydrological assessments of hazardous waste disposal/spill sites, determination of rates and extents of contaminant migration, and computer modeling of groundwater flow and contaminant transport. Projects are for the U.S. Air Force and Air National Guard Installation Restoration Program.

Froehling and Robertson, Inc. (1986-1987): Geologist/Engineering Technician

Performed both field and laboratory engineering soils tests.

The Nature Conservancy (1985-1986): Hydrogeologist

Investigated groundwater geology of the Nature Conservancy's Nags Head Woods Ecological Preserve in Dare County, North Carolina. Study included installing wells, monitoring water table levels, determination of hydraulic parameters through a pumping test, stratigraphic test borings, and computer modeling.

Old Dominion University (1983-1985): Teaching Assistant, Department of Geological Sciences

Taught laboratory classes in Earth Science and Historical Geology.

PROFESSIONAL AFFILIATIONS

Geological Society of America
National Water Well Association/Association of Ground Water Scientists and Engineers

PUBLICATION

Impact of Municipal Pumpage Upon a Barrier Island Water Table, Nags Head and Kill Devil Hills, North Carolina. In: Abstracts with Programs, Geological Society of America, Vol. 19, No. 2, February 1987.

RAYMOND G. CLARK, JR.

EDUCATION

Completed graduate engineering courses, George Washington University, 1957
B.S., Mechanical Engineering, University of Maryland, 1949

SPECIALIZED TRAINING

Grad. European Command Military Assistance School, Stuttgart, 1969
Grad. Army Psychological Warfare School, Fort Bragg, 1963
Grad. Sanz School of Languages, D.C., 1963
Grad. DOD Military Assistance Institute, Arlington, 1963
Grad. Defense Procurement Management Course, Fort Lee, 1960
Grad. Engineer Officer's Advanced Course, Fort Belvoir, 1958

CERTIFICATIONS

Registered Professional Engineer: Kentucky (#4341); Virginia (#8303); Florida (#36228)

EXPERIENCE

Thirty-one years of experience in engineering design, planning and management including construction and construction management, environmental, operations and maintenance, repair and utilities, research and development, electrical, mechanical, master planning and city management. Over six years' logistical experience including planning and programming of military assistance materiel and training for foreign countries, serving as liaison with American private industry, and directing materiel storage activities in an overseas area. Over two years' experience as an engineering instructor. Extensive experience in personnel management, cost reduction programs, and systems improvement.

EMPLOYMENT

Dynamac Corporation (1986-present): Program Manager/Department Manager

Responsible for activities relating to Preliminary Analysis, Site Investigations, Remedial Investigations, Feasibility Studies, and Remedial Action for the Installation Restoration Program for the U.S. Air Force, Air National Guard, Bureau of Prisons, and the U.S. Coast Guard, including records search, review and evaluation of previous studies; preparation of statements of work, feasibility studies; preparation of remedial action plans, designs and specifications; review of said studies/plans to ensure that they are in conformance with requirements; review of environmental studies and reports; preparation of Air Force Installation Restoration Program Management Guidance; and preparation of Part B permits.

Howard Needles Tammen & Bergendoff (HNTB) (1981-1986): Manager

Responsible, as Project Manager, for: design of a new concourse complex at Miami International Airport to include terminal building, roadway system, aircraft apron, drainage channel relocation, satellite building with underground pedestrian tunnel, and associated underground utility corridors, to include subsurface aircraft fueling systems, with an estimated construction cost of $163 million; a cargo vehicle tunnel under the crosswind runway with an estimated construction cost of $15 million; design and construction of two large corporate jet aircraft hangars; and for the hydrocarbon recovery program to include investigation, analysis, design of recovery systems, monitoring of recovery systems, and planning and design of residual recovery systems utilizing biodegradation. Participated, as sub-consultant, in Air Force IRP seminar.

HNTB (1979-1981): Airport Engineer

Responsibilities included development of master plan for Iowa Air National Guard base; project initiation assistance for a new regional airport in Florida; engineering assistance for new facilities design and construction for Maryland Air National Guard; master plan for city maintenance facilities, Orlando, Florida; in-country master plan and preliminary engineering project management for Madrid, Spain, International Airport; and project management of master plan for Whiting Naval Air Station and outlying fields in Florida.

HNTB (1974-1979): Design Engineer

Responsibilities included development of feasibility and site selection studies for reliever airports in Cleveland and Atlanta; site selection and facilities requirements for the Office of Aeronautical Charting and Cartography, NOAA; and onsite mechanical and electrical engineering design for terminal improvements at Baltimore-Washington International Airport, Maryland.

HNTB (1972-1974): Airport Engineer

Responsible for development of portions of the master plan and preliminary engineering for a new international airport for Lisbon, Portugal, estimated to cost $250 million.

Self-employed (1971-1972): Private Consultant

Responsible for engineering planning and installation of a production line for multimillion-dollar contract in Madrid, Spain, to fabricate transmissions and differentials for U.S. Army vehicles.

U.S. Army, Corps of Engineers (1969-1971): Chief, Materiel & Programs

Directed materiel planning and military training programs of military assistance to the Spanish Army. Controlled arrival and acceptance of materiel by host government. Served as liaison/advisor to American industry interested

in conducting business with Spanish government. Was Engineer Advisor to Spanish Army Construction, Armament and Combat Engineers, also the Engineer Academy and Engineer School of Application.

<u>Corps of Engineers (1968-1969)</u>: Chief, R&D Branch, OCE

Directed office responsible to Chief of Engineers for research and development. Developed research studies in new concepts of bridging, new explosives, family of construction equipment, night vision equipment, expedient airfield surfacing, expedient aircraft fueling systems, water purification equipment and policies, prefabricated buildings, etc. Achieved Department of Army acceptance for development and testing of new floating bridge. Participated in high-level Department Committee charged with development of a Tactical Gap Crossing Capability Model.

<u>Corps of Engineers (1967-1968)</u>: Division Engineer

Facilities engineer in Korea. Was fully responsible for management and maintenance of 96 compounds within 245 square miles including 6,000+ buildings, 1 million linear feet of electrical distribution lines, 18 water purification and distribution systems, sanitary sewage disposal systems, roads, bridges, and fire protection facilities with real property value of more than $256 million. Planned and developed the first five-year master plan for this area. Administered $12 million budget and $2 million engineer supply operation. Was in responsible charge of over 500 persons. Developed and obtained approval for additional projects worth $9 million for essential maintenance and repair. Directed cost reduction programs that produced more than $500,000 savings to the United States in the first year.

<u>Corps of Engineers (1963-1967)</u>: Engineer Advisor

Engineer and aviation advisor to the Spanish Army. Developed major modernization program for Spanish Army Engineers, including programming of modern engineer and mobile maintenance equipment. Directed U.S. portion of construction, testing and acceptance of six powder plants, one shell loading facility, an Engineer School of Application, and depot rebuild facilities for engineer, artillery, and armor equipment. Planned and developed organization of a helicopter battalion for the Spanish Army. Responsible for sales, delivery, assembly and testing of 12 new helicopters in country. Provided U.S. assistance to unit until self-sufficiency was achieved. Was U.S. advisor to Engineer Academy, School of Application and Polytechnic Institute.

<u>Corps of Engineers (1960-1963)</u>: Deputy District Engineer

Responsible for planning and development of extensive construction projects in the Ohio River Basin for flood control and canalization, including dam, lock, bridge, and building construction, highway relocation, watershed studies, real estate acquisitions and dispositions. Was contracting officer for more than $75

million of projects per year. Supervised approximately 1,300 personnel, including 300 engineers. Planned and directed cost reduction programs amounting to more than $200,000 per year. Programmed and controlled development of a modern radio and control net in a four-state area.

Corps of Engineers (1959-1960): Area Engineer

Directed construction of a large airfield in Ohio as Contracting Officer's representative. Assured that all construction (runway, steam power plant, fuel transfer and loading facilities, utilities, buildings, etc.) complied with terms of plans and specifications. Was onsite liaison between Air Force and contractors.

Corps of Engineers (1958-1959): Chief, Supply Branch

Managed engineer supply yard containing over $21 million construction supplies and engineer equipment. Directed in-storage maintenance, processing and deprocessing of equipment. Achieved complete survey of items on hand, a new locator system and complete rewarehousing, resulting in approximately $159,000 savings in the first year.

Corps of Engineers (1957-1958): Student

U.S. Army Engineer School, Engineer Officer's Advanced Course.

Corps of Engineers (1954-1957): Engineer Manager

Managed engineer construction projects and was assigned to staff and faculty of the Engineer School. Was in charge of instruction on engineer equipment utilization, management and maintenance. Directed Electronic Section of the school. Coordinated preparation of five-year master plan for the Department of Mechanical and Technical Equipment.

Corps of Engineers (1949-1954): Engineer Commander

Positions of minor but increasing importance and responsibility in engineering management, communications, demolitions, construction administration and logistics.

PROFESSIONAL AFFILIATIONS

Member, National Society of Professional Engineers
Fellow, Society of American Military Engineers
Member, American Society of Civil Engineers
Member, Virginia Engineering Society
Member, Project Management Institute

HARDWARE

IBM PC

SOFTWARE

Lotus 1-2-3, D Base III Plus, Framework, Project Scheduler 5000, Harvard Project Manager, Volkswriter, Microsoft Project

MARK D. JOHNSON

EDUCATION

B.S., Geology, James Madison University, 1980

EXPERIENCE

Eight years' technical and management experience including geologic mapping, subsurface investigations, foundation inspections, groundwater monitoring, pumping and observation well installation, geotechnical instrumentation, groundwater assessment, preparation of Air Force Installation Restoration Program Guidance, preparation of statements of work for environmental field monitoring and feasibility studies for the Air Force and the Air National Guard, development of environmental field monitoring programs, and preparation of Preliminary Assessments for the Air National Guard.

EMPLOYMENT

Dynamac Corporation (1984-present): Senior Staff Scientist/Geologist

Primarily responsible for developing and managing technical support programs relevant to CERCLA related activities for the Air Force, Air National Guard, Department of Justice and Coast Guard. These activities include Statements of Work for Site Investigations (SI), Remedial Investigations (RI), and Feasibility Studies (FS); assessing groundwater at hazardous waste disposal/spill sites for the purpose of determining rates and extents of contaminant migration and for developing SI and RI programs and identifying remedial actions; reviewing SI, RI and FS contractor work plans for various government clients, developing technical and contractual requirements for SI, RI and FS projects, managing the development and preparation of Preliminary Assessments, and assisting clients in the development of their environmental management programs, which included preparation of the Air Force's Installation Restoration Program Management Guidance document.

Bechtel Associates Professional Corporation (1981-1984): Geologist

Performed the following duties in conjunction with major civil engineering projects including subways, nuclear power plants and buildings: prepared geologic maps of surface and subsurface facilities in rock and soil including tunnels, foundations and vaults; assessed groundwater conditions in connection with construction activities and groundwater control systems; monitored the installation of permanent and temporary dewatering systems and observation wells; monitored surface and subsurface settlement of tunnels; and participated in subsurface investigations.

Schnabel Engineering Associates (1981): Geologist

Inspected foundations and backfill placement.

PROFESSIONAL CREDENTIALS

Registered Professional Geologist, South Carolina, #116, 1987

PROFESSIONAL AFFILIATIONS

Association of Engineering Geologists
National Water Well Association/Association of Ground Water Scientists and Engineers

APPENDIX B

OUTSIDE AGENCY CONTACT LIST

OUTSIDE AGENCY CONTACT LIST

Alaskan Department of Environmental Conservation
3601 C Street, Suite 1350
Anchorage, AK 99508
Bruce Erickson and James Hayden, (907) 563-6529

Arctic Environmental Information and Data Center
University of Alaska - Fairbanks
707 A Street
Anchorage, AK 99501
(907) 257-2733

National Oceanic and Atmospheric Administration
Office of Hydrology
c/o National Weather Service
Grammax Building
8060 13th Street
Silver Spring, MD 20910
(301) 427-7543

National Oceanic and Atmospheric Administration
701 C Street, Box 38
Anchorage, AK 99513
(907) 271-5040

State of Alaska Department of Natural Resources
Division of Geological and Geophysical Surveys
3700 Airport Way
Fairbanks, AK 99709-4609
Mark Robinson (907) 474-7147

U.S. Fish and Wildlife Services
1011 East Tudor Road
Anchorage, AK
Ronald Garrett, (907) 786-3435

U.S. Fish and Wildlife Service
1412 Airport Way
Fairbanks, AK 99701-8524
R.E. (Skip) Ambrose, (907) 456-0239

U.S. Geological Survey
12201 Sunrise Valley Drive
Reston, VA 22092

U.S. Geological Survey
4200 University Drive
Anchorage, AK 99508
Oscar J. Ferrians, Jr., (907) 561-1181

U.S. Soil Conservation Service
201 East 9th Avenue, Suite 300
Anchorage, AK
(907) 271-2424

APPENDIX C

USAF HAZARD ASSESSMENT RATING METHODOLOGY

USAF HAZARD ASSESSMENT RATING METHODOLOGY

The Department of Defense (DoD) has established a comprehensive program to identify, evaluate, and control problems associated with past disposal practices at DoD facilities. One of the actions required under this program is to:

> develop and maintain a priority listing of contaminated installations and facilities for remedial action based on potential hazard to public health, welfare, and environmental impacts (Reference: DEQPPM 81-5, 11 December 1981).

Accordingly, the United States Air Force (USAF) has sought to establish a system to set priorities for taking further actions at sites based upon information gathered during the Preliminary Assessment phase of its Installation Restoration Program (IRP).

PURPOSE

The purpose of the site rating model is to provide a relative ranking of sites of suspected contamination from hazardous substances. This model will assist the Air National Guard in setting priorities for follow-on site investigations.

This rating system is used only after it has been determined that (1) potential for contamination exists (hazardous wastes present in sufficient quantity), and (2) potential for migration exists. A site can be deleted from consideration for rating on either basis.

DESCRIPTION OF MODEL

Like the other hazardous waste site ranking models, the U.S. Air Force's site rating model uses a scoring system to rank sites for priority attention. However, in developing this model, the designers incorporated some special features to meet specific DoD program needs.

The model uses data readily obtained during the Preliminary Assessment portion of the IRP. Scoring judgment and computations are easily made. In assessing the hazards at a given site, the model develops a score based on the most likely routes of contamination and the worst hazards at the site. Sites are given low scores only if there are clearly no hazards. This approach meshes well with the policy for evaluating and setting restrictions on excess DoD properties.

Site scores are developed using the appropriate ranking factors according to the method presented in the flow chart (Figure 1 of this report). The site rating form and the rating factor guideline are provided at the end of this appendix.

As with the previous model, this model considers four aspects of the hazard posed by a specific site: possible receptors of the contamination, the waste and its characteristics, the potential pathways for contaminant migration, and any efforts that were made to contain the wastes resulting from a spill.

The receptors category rating is based on four rating factors: the potential for human exposure to the site, the potential for human ingestion of contaminants should underlying aquifers be polluted, the current and anticipated uses of the surrounding area, and the potential for adverse effects upon important biological resources and fragile natural settings. The potential for human exposure is evaluated on the basis of the total population within 1,000 feet of the site, and the distance between the site the the base boundary. The potential for human ingestion of contaminants is based on the distance between the site and the nearest well, the groundwater use of the uppermost aquifer, and population served by the groundwater supply within 3 miles of the site. The uses of the surrounding area are determined by the zoning within a 1-mile radius. Determination of whether or not critical environments exist within a 1-mile radius of the site predicts the potential for adverse effects from the site upon important biological resources and fragile natural settings. Each rating factor is numerically evaluated (0-3) and increased by a multiplier. The maximum possible score is also computed. The factor score and maximum possible scores are totaled, and the receptors subscore computed as follows: receptors subscore = (100 x factor score subtotal/maximum score subtotal).

The waste characteristics category is scored in three stages. First, a point rating is assigned based on an assessment of the waste quantity and the hazard (worst case) associated with the site. The level of confidence in the information is also factored into the assessment. Next, the score is multiplied by a waste persistence factor, which acts to reduce the score if the waste is not very persistent. Finally, the score is further modified by the physical state of the waste. Liquid wastes receive the maximum score, while scores for sludges and solids are reduced.

The pathways category rating is based on evidence of contaminant migration or an evaluation of the highest potential (worst case) for contaminant migration along one of three pathways: surface-water migration, flooding, and groundwater migration. If evidence of contaminant migration exists, the category is given a subscore of 80 to 100 points. For indirect evidence, 80 points are assigned, and for direct evidence, 100 points are assigned. If no evidence is found, the highest score among the three possible routes is used. The three pathways are evaluated and the highest score among all four of the potential scores is used.

The scores for each of the three categories are added together and normalized to a maximum possible score of 100. Then the waste management practice category is scored. Scores for sites with no containment can be reduced by 5 percent. If a site is contained and well managed, its score can be reduced by 90 percent. The final site score is calculated by applying the waste management practices category factor to the sum of the scores for the other three categories.

APPENDIX D

USAF HAZARD ASSESSMENT RATING GUIDELINES, FACTOR RATING CRITERIA, AND SITE HAZARDOUS ASSESSMENT FORMS

HAZARDOUS ASSESSMENT RATING METHODOLOGY GUIDELINES

I. RECEPTORS CATEGORY

Rating Factors	Rating Scale Levels 0	1	2	3	Multiplier
A. Population within 1,000 feet (includes on-base facilities)	0	1-25	26-100	Greater than 100	4
B. Distance to nearest water well	Greater than 3 miles	1 to 3 miles	3,001 feet to 1 mile	0 to 3,000 feet	10
C. Land Use/Zoning (within 1-mile radius)	Completely remote (zoning not applicable)	Agricultural	Commercial or Industrial	Residential	3
D. Distance to installation boundary	Greater than 2 miles	1 to 2 miles	1,001 feet to 1 mile	0 to 1,000 feet	6
E. Critical environments (within 1-mile radius)	Not a critical environment	Natural areas	Pristine natural areas; minor wetlands; preserved areas; presence or economically important natural resources susceptible to contamination	Major habitat of an endangered or threatened species; presence of recharge area major wetlands	10
F. Water quality/use designation of nearest surface water body	Agricultural or industrial use	Recreation, propagation and management of fish and wildlife	Shellfish propagation and harvesting	Potable water supplies	6
G. Ground-water use of uppermost aquifer	Not used, other sources readily available	Commercial, industrial, or irrigation, very limited other water sources	Drinking water, municipal water available	Drinking water, no municipal water available; commercial, industrial, or irrigation, no other water source available	9
H. Population served by surface water supplies within 3 miles downstream of site	0	1-50	51-1,000	Greater than 1,000	6
I. Population served by aquifer supplies within 3 miles of site	0	1-50	51-1,000	Greater than 1,000	6

II. WASTE CHARACTERISTICS

A-1 Hazardous Waste Quantity

S = Small quantity (5 tons or 20 drums of liquid)
M = Moderate quantity (5 to 20 tons or 21 to 85 drums of liquid)
L = Large quantity (20 tons or 85 drums of liquid)

A-2 Confidence Level of Information

C = Confirmed confidence level (minimum criteria below)

- o Verbal reports from interviewer (at least 2) or written information from the records
- o Knowledge of types and quantities of wastes generated by shops and other areas on base

S = Suspected confidence level

- o No verbal reports or conflicting verbal reports and no written information from the records

Logic based on the knowledge of the types and quantities of hazardous wastes generated at the base, and a history of past waste disposal practices indicate that these wastes were disposed of at a site

A-3 Hazard Rating

Rating Factors	Rating Scale Levels: 0	1	2	3
Toxicity	Sax's Level 0	Sax's Level 1	Sax's Level 2	Sax's Level 3
Ignitability	Flash point greater than 200° F	Flash point at 140° F to 200° F	Flash point at 80° F to 140° F	Flash point less than 80° F
Radioactivity	At or below background levels	1 to 3 times background levels	3 to 5 times background levels	Over 5 times background levels

Use the highest individual rating based on toxicity, ignitability and radioactivity and determine the hazard rating.

Hazard Rating	Points
High (H)	3
Medium (M)	2
Low (L)	1

II. WASTE CHARACTERISTICS--Continued

Waste Characteristics Matrix

Point Rating	Hazardous Waste Quantity	Confidence Level of Information	Hazard Rating
100	L	C	H
	L	C	M
80	M	C	H
70	L	S	H
60	S	C	H
	M	C	M
	L	S	M
50	L	C	L
	M	S	H
	S	C	M
	S	S	H
40	M	S	M
	M	C	L
	L	S	L
	S	C	L
30	M	S	L
	S	S	M
20	S	S	L

Notes:

For a site with more than one hazardous waste, the waste quantities may be added using the following rules:

Confidence Level

- o Confirmed confidence levels (C) can be added.
- o Suspected confidence levels (S) can be added.
- o Confirmed confidence levels cannot be added with suspected confidence levels.

Waste Hazard Rating

- o Wastes with the same hazard rating can be added.
- o Wastes with different hazard ratings can only be added in a downgrade mode, e.g., MCM + SCH = LCM if the total quantity is greater than 20 tons.

Example: Several wastes may be present at a site, each having an MCM designation (60 points). By adding the quantities of each waste, the designation may change to LCM (80 points). In this case, the correct point rating for the waste is 80.

B. Persistence Multiplier for Point Rating

Persistence Criteria	Multiply Point Rating From Part A by the Following
Metals, polycyclic compounds, and halogenated hydrocarbons	1.0
Substituted and other ring compounds	0.9
Straight chain hydrocarbons	0.8
Easily biodegradable compounds	0.4

C. Physical State Multiplier

Physical State	Multiply Point Total From Parts A and B by the Following
Liquid	1.0
Sludge	0.75
Solid	0.50

III. PATHWAYS CATEGORY

A. Evidence of Contamination

Direct evidence is obtained from laboratory analyses of hazardous contaminants present above natural background levels in surface water, ground water, or air. Evidence should confirm that the source of contamination is the site being evaluated.

Indirect evidence might be from visual observation (i.e., leachate), vegetation stress, sludge deposits, presence of taste and odors in drinking water, or reported discharges that cannot be confirmed as resulting from the site, but the site is greatly suspected of being a source of contamination.

B-1 Potential for Surface Water Contamination

Rating Factors	Rating Scale Levels 0	1	2	3	Multiplier
Distance to nearest surface water (including drainage ditches and storm sewers)	Greater than 1 mile	2,001 feet to 1 mile	501 feet to 2,000 feet	0 to 500 feet	8
Net precipitation	Less than -10 inches	-10 to +5 inches	+5 to +20 inches	Greater than +20 inches	6
Surface erosion	None	Slight	Moderate	Severe	8
Surface permeability	0% to 15% clay ($>10^{-2}$ cm/sec)	15% to 30% clay (10^{-2} to 10^{-4} cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	Greater than 50% clay ($<10^{-6}$ cm/sec)	6
Rainfall intensity based on 1-year 24-hour rainfall (Number of thunderstorms)	<1.0 inch (0-5)	1.0 to 2.0 inches (6-35)	2.1 to 3.0 inches (36-49)	>3.0 inches (>50)	8

B-2 Potential for Flooding

Floodplain	Beyond 100-year floodplain	In 100-year floodplain	In 10-year floodplain	Floods annually	1

B-3 Potential for Ground-Water Contamination

Depth to groundwater	Greater than 500 feet	50 to 500 feet	11 to 50 feet	0 to 10 feet	8
Net precipitation	Less than -10 inches	-10 to +5 inches	+5 to +20 inches	Greater than +20 inches	8
Soil permeability	Greater than 50% clay ($<10^{-6}$ cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	15% to 30% clay (10^{-2} to 10^{-4} cm/sec)	0% to 15% clay ($>10^{-2}$ cm/sec)	8
Subsurface flows	Bottom of site greater than 5 feet above high ground-water level	Bottom of site occasionally submerged	Bottom of site frequently submerged	Bottom of site located below mean ground-water level	8

B-3 Potential for Ground-Water Contamination -Continued

Rating Factors	Rating Scale Levels 0	1	2	3	Multiplier
Direct access to groundwater (through faults, fractures, faulty well casings, subsidence, fissures, etc.)	No evidence of risk	Low risk	Moderate risk	High risk	8

IV. WASTE MANAGEMENT PRACTICES CATEGORY

A. This category adjusts the total risk as determined from the receptors, pathways, and waste characteristics categories for waste management practices and engineering controls designed to reduce this risk. The total risk is determined by first averaging the receptors, pathways, and waste characteristics subscores.

B. Waste Management Practices Factor

The following multipliers are then applied to the total risk points (from A):

Waste Management Practice	Multiplier
No containment	1.0
Limited containment	0.95
Fully contained and in full compliance	0.10

Guidelines for fully contained:

Landfills:

- o Clay cap or other impermeable cover
- o Leachate collection system
- o Liners in good condition
- o Adequate monitoring wells

Surface Impoundments:

- o Liners in good condition
- o Sound dikes and adequate freeboard
- o Adequate monitoring wells

Spills:

- o Quick spill cleanup action taken
- o Contaminated soil removed
- o Soil and/or water samples confirm total cleanup of the spill

Fire Protection Training Areas:

- o Concrete surface and berms
- o Oil/water separator for pretreatment of runoff
- o Effluent from oil/water separator to treatment plant

General Note: If data are not available or known to be complete the factor ratings under items I-A through I, III-B-1, or III-6-3, then leave blank for calculation of factor score and maximum possible score.

Naknek Recreational Camps
Naknek, Alaska

USAF Hazard Assessment Rating Methodology
Factor Rating Criteria

1. RECEPTORS CATEGORY	RATING SCALE LEVELS	NUMERICAL VALUE
Population within 1,00 feet of site:		
Site No. 1	0	0
Site No. 2	0	0
Site No. 3	0	0
Distance to nearest well:		
Site No. 1	3,001 feet to 1 mile	2
Site No. 2	3,001 feet to 1 mile	2
Site No. 3	3,001 feet to 1 mile	2
Land use/zoning within 1-mile radius:	Completely remote	0
Distance Base boundary:		
Site No. 1	Below 1,000 feet	3
Site No. 2	Below 1,000 feet	3
Site No. 3	Below 1,000 feet	3
Critical environments within 1-mile radius:	Pristine natural areas; minor wetlands preserved areas, presence or economically imported natural resources susceptible to contamination	2
Water quality of nearest surface water body:	Recreation propogation and management of fish and wildlife	1
Groundwater use of uppermost aquifer:	Not used	0

Naknek Recreational Camps
Naknek, Alaska

USAF Hazard Assessment Rating Methodology
Factor Rating Criteria

	RATING SCALE LEVELS	NUMERICAL VALUE
1. RECEPTORS CATEGORY (Continued)		
Population served by surface water supply within 3 miles downstream of site:	0	0
Population served by groundwater supply within 3 miles of site:	51 to 1,000	2
2. WASTE CHARACTERISTICS		
Quantity:		
Site No. 1	Moderate quantity	M
Site No. 2	Small quantity	S
Site No. 3	Small quantity	S
Confidence Level:		
Site No. 1	Suspected	S
Site No. 2	Suspected	S
Site No. 3	Suspected	S
Hazard Rating:		
Toxicity		
Site No. 1	Sax's Level 3	3
Site No. 2	Sax's Level 3	3
Site No. 3	Sax's Level 3	3
Ignitability		
Site No. 1	Flash point less than 80°F	3
Site No. 2	Flash point less than 80°F	3
Site No. 3	Flash point less than 80°F	3

Naknek Recreational Camps
Naknek, Alaska

USAF Hazard Assessment Rating Methodology
Factor Rating Criteria

2. WASTE CHARACTERISTICS (Continued)	RATING SCALE LEVELS	NUMERICAL VALUE
Hazard Rating (Continued):		
Radioactivity		
Site No. 1	At or below background levels	0
Site No. 2	At or below background levels	0
Site No. 3	At or below background levels	0
Persistance Multiplier:		
Site No. 1	Metals, polycyclic compounds and halogenated hydrocarbons	1.0
Site No. 2	Metals, polycyclic compounds, and halogenated hydrocarbons	1.0
Site No. 3	Metals, polycyclic compounds and halogenated hydrocarbons	1.0
Physical State Multiplier:		
Site No. 1	Liquid	1.0
Site No. 2	Liquid	1.0
Site No. 3	Liquid	1.0

3. PATHWAYS CATEGORY		
Evidence of Contamination:		
Site No. 1	Indirect evidence from visual observation or reported discharges cannot be directly confirmed as resulting from the site, but the site is greatly suspected as a contamination source	80

Naknek Recreational Camps
Naknek, Alaska

USAF Hazard Assessment Rating Methodology
Factor Rating Criteria

3. PATHWAYS CATEGORY (Continued)	RATING SCALE LEVELS	NUMERICAL VALUE
Evidence of Contamination: (Continued)		
Site No. 2	Indirect evidence from visual observation or reported discharges cannot be directly confirmed as resulting from the site, but the site is greatly suspected as a contamination source	80
Site No. 3	Indirect evidence from visual observation or reported discharges cannot be directly confirmed as resulting from the site, but the site is greatly suspected as a contamination source	80
Surface Water Migration:		
Distance to nearest surface water		
Site No. 1	0 to 500 feet	3
Site No. 2	0 to 500 feet	3
Site No. 3	501 to 2,000 feet	2
Net precipitation	-10 to +5 inches	1
Surface erosion	Moderate	2
Surface permeability	30% to 50% clay (10^{-6} to 10^{-4} cm/sec)	2
Rainfall intensity	1.0 to 2.0 inches	1
Flooding:		
Site No. 1	Beyond 100-year flood plain	0
Site No. 2	In 100-year flood plain	1
Site No. 3	Beyond 100-year flood plain	0

Naknek Recreational Camps
Naknek, Alaska

USAF Hazard Assessment Rating Methodology
Factor Rating Criteria

3. PATHWAYS CATEGORY (Continued)	RATING SCALE LEVELS	NUMERICAL VALUE
Groundwater Migration:		
Depth to groundwater	50 to 500 feet	1
Net precipitation	-10 to +5 inches	1
Soil permeability	15% to 30% clay (10^{-4} and 10^{-2} cm/sec)	2
Subsurface flow		
Site No. 1	Bottom of site greater than 5 feet above high groundwater level	0
Site No. 2	Bottom of site occasionally submerged	1
Site No. 3	Bottom of site greater than 5 feet above high groundwater level	0
Direct access to groundwater	No evidence of risk	0

4. WASTE MANAGEMENT PRACTICES

Practice:		
Site No. 1	No containment	1.0
Site No. 2	No containment	1.0
Site No. 3	No containment	1.0

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE LANDFILL (SITE 1)
LOCATION NAKNEK CAMP I, ALASKA
DATE OF OPERATION/OCCURRENCE 1956 TO 1977
OWNER/OPERATOR ALASKAN AIR COMMAND
COMMENTS DESCRIPTION
RATED BY HMTC

I. RECEPTORS

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
A. POPULATION WITHIN 1000 FEET OF SITE	:	0	4	0	12
B. DISTANCE TO NEAREST WELL	:	2	10	20	30
C. LAND USE/ZONING WITHIN 1 MILE RADIUS	:	0	3	0	9
D. DISTANCE TO INSTALLATION BOUNDARY	:	3	6	18	18
E. CRITICAL ENVIRONMENTS WITHIN 1 MILE RADIUS OF SITE	:	2	10	20	30
F. WATER QUALITY OF NEAREST SURFACE WATER	:	1	6	6	18
G. GROUND WATER USE OF UPPERMOST AQUIFER	:	0	9	0	27
H. POPULATION (WITHIN 3 MILES) SERVED BY					
DOWN STREAM SURFACE WATER	:	0	6	0	18
GROUND WATER	:	2	6	12	18
		SUBTOTALS		76	180

RECEPTORS SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL) 42

II. WASTE CHARACTERISTICS

A. SELECT THE FACTOR SCORE BASED ON THE ESTIMATED QUANTITY, THE DEGREE OF HAZARD, AND THE CONFIDENCE LEVEL OF THE INFORMATION.

1. WASTE QUANTITY (S=SMALL, M=MEDIUM, L=LARGE) (M)
2. CONFIDENCE LEVEL (S=SUSPECT, C=CONFIRM) (S)
3. HAZARD RATING (L=LOW, M=MEDIUM, H=HIGH) (H)

FACTOR SUBSCORE A (50)
(FROM 20 TO 100 BASED ON FACTOR SCORE MATRIX)

B. APPLY PERSISTENCE FACTOR

FACTOR SUBSCORE A x PERSISTENCE FACTOR = SUBSCORE B
(50)(1) = (50)

C. APPLY PHYSICAL STATE MULTIPLIER

SUBSCORE B x PHYSICAL STATE MULTIPLIER = WASTE CHARACTERISTICS SUBSCORE
(50)(1) = (50)

III. PATHWAY

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE

A. IF THERE IS EVIDENCE OF MIGRATION OF HAZARDOUS CONTAMINANTS, ASSIGN MAXIMUM FACTOR SUBSCORE OF (100 POINTS FOR DIRECT EVIDENCE) OR (80 POINTS FOR INDIRECT EVIDENCE). IF DIRECT EVIDENCE (100) EXISTS THEN PROCEED TO C. IF NO EVIDENCE OR INDIRECT EVIDENCE (80 OR LESS) EXISTS, PROCEED TO B.

(80)

B. RATE THE MIGRATION POTENTIAL FOR 3 POTENTIAL PATHWAYS: SURFACE WATER MIGRATION, FLOODING, AND GROUND-WATER MIGRATION. SELECT THE HIGHEST RATING, AND PROCEED TO C.

1. SURFACE WATER MIGRATION

DISTANCE TO NEAREST SURFACE WATER	:	3	8	24	24
NET PRECIPITATION	:	1	6	6	18
SURFACE EROSION	:	2	8	16	24
SURFACE PERMEABILITY	:	2	6	12	18
RAINFALL INTENSITY	:	1	8	8	24
SUBTOTALS				66	108
SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL)					61

2. FLOODING

		0	1	0	3
SUBSCORE (100 x FACTOR SCORE /3)	:				0

3. GROUND WATER MIGRATION

DEPTH TO GROUND WATER	:	1	8	8	24
NET PRECIPITATION	:	1	6	6	18
SOIL PERMEABILITY	:	2	8	16	24
SUBSURFACE FLOWS	:	0	8	0	24
DIRECT ACCESS TO GROUND WATER	:	0	8	0	24
SUBTOTALS				[illegible]	114
SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL)					26

C. HIGHEST PATHWAY SUBSCORE

ENTER THE HIGHEST SUBSCORE VALUE FROM A, B-1, B-2 OR B-3 ABOVE.

(80)

IV. WASTE MANAGEMENT PRACTICES

A. AVERAGE THE THREE SUBSCORES FOR RECEPTORS, WASTE CHARACTERISTICS, AND PATHWAYS.

RECEPTORS	(**42**)
WASTE CHARACTERISTICS	(50)
PATHWAYS	(80)
TOTAL DIVIDED BY 3 = GROSS TOTAL SCORE	(**57**)

B. APPLY FACTOR FOR WASTE CONTAINMENT FROM WASTE MANAGEMENT PRACTICES

GROSS TOTAL SCORE x	WASTE MANAGEMENT PRACTICES FACTOR	=	FINAL SCORE
(**57**) x	(1)	=	**57**

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HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE   DRUM AREA (SITE 2)
LOCATION   NAKNEK CAMP I, ALASKA
DATE OF OPERATION/OCCURRENCE   1956 TO 1977
OWNER/OPERATOR   ALASKAN AIR COMMAND
COMMENTS/DESCRIPTION
RATED BY   HMTC

I. RECEPTORS

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
A. POPULATION WITHIN 1000 FEET OF SITE	:	0	4	0	12
B. DISTANCE TO NEAREST WELL	:	2	10	20	30
C. LAND USE/ZONING WITHIN 1 MILE RADIUS	:	0	3	0	9
D. DISTANCE TO INSTALLATION BOUNDARY	:	3	6	18	18
E. CRITICAL ENVIRONMENTS WITHIN 1 MILE RADIUS OF SITE	:	2	10	20	30
F. WATER QUALITY OF NEAREST SURFACE WATER	:	1	6	6	18
G. GROUND WATER USE OF UPPERMOST AQUIFER	:	0	9	0	27
H. POPULATION (WITHIN 3 MILES) SERVED BY					
DOWN STREAM SURFACE WATER	:	0	6	0	18
GROUND WATER	:	2	6	12	18
	SUBTOTALS			76	180

RECEPTORS SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL)   42

II. WASTE CHARACTERISTICS

A. SELECT THE FACTOR SCORE BASED ON THE ESTIMATED QUANTITY, THE DEGREE OF HAZARD, AND THE CONFIDENCE LEVEL OF THE INFORMATION.

1. WASTE QUANTITY (S=SMALL, M=MEDIUM, L=LARGE) (S)
2. CONFIDENCE LEVEL (S=SUSPECT, C=CONFIRM) (S)
3. HAZARD RATING (L=LOW, M=MEDIUM, H=HIGH) (H)

FACTOR SUBSCORE A (40)
(FROM 20 TO 100 BASED ON FACTOR SCORE MATRIX)

B. APPLY PERSISTENCE FACTOR

FACTOR SUBSCORE A x PERSISTENCE FACTOR = SUBSCORE B
(40)(1) = (40)

C. APPLY PHYSICAL STATE MULTIPLIER

SUBSCORE B x PHYSICAL STATE MULTIPLIER = WASTE CHARACTERISTICS SUBSCORE
(40)(1) = (40)

III. PATHWAY

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE

A. IF THERE IS EVIDENCE OF MIGRATION OF HAZARDOUS CONTAMINANTS, ASSIGN MAXIMUM FACTOR SUBSCORE OF (100 POINTS FOR DIRECT EVIDENCE) OR (80 POINTS FOR INDIRECT EVIDENCE). IF DIRECT EVIDENCE (100) EXISTS THEN PROCEED TO C. IF NO EVIDENCE OR INDIRECT EVIDENCE (80 OR LESS) EXISTS, PROCEED TO B.

30)

B. RATE THE MIGRATION POTENTIAL FOR 3 POTENTIAL PATHWAYS: SURFACE WATER MIGRATION, FLOODING, AND GROUND-WATER MIGRATION. SELECT THE HIGHEST RATING, AND PROCEED TO C.

1. SURFACE WATER MIGRATION

DISTANCE TO NEAREST SURFACE WATER	:	3	8	24	24
NET PRECIPITATION	:	1	6	6	18
SURFACE EROSION	:	2	8	16	24
SURFACE PERMEABILITY	:	2	6	12	18
RAINFALL INTENSITY	:	1	8	8	24
SUBTOTALS				66	108
SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL)					61

2. FLOODING

FLOODING		1	1	1	3
SUBSCORE (100 x FACTOR SCORE /3)	:				**33**

3. GROUND WATER MIGRATION

DEPTH TO GROUND WATER	:	1	8	8	24
NET PRECIPITATION	:	1	6	6	18
SOIL PERMEABILITY	:	2	8	16	24
SUBSURFACE FLOWS	:	1	8	8	24
DIRECT ACCESS TO GROUND WATER	:	0	8	0	24
SUBTOTALS				38	114
SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL)					33

C. HIGHEST PATHWAY SUBSCORE

ENTER THE HIGHEST SUBSCORE VALUE FROM A, B-1, B-2 OR B-3 ABOVE.

30)

IV. WASTE MANAGEMENT PRACTICES

A. AVERAGE THE THREE SUBSCORES FOR RECEPTORS, WASTE CHARACTERISTICS, AND PATHWAYS.

RECEPTORS	(42)
WASTE CHARACTERISTICS	(40)
PATHWAYS	(30)
TOTAL DIVIDED BY 3 = GROSS TOTAL SCORE	(54)

B. APPLY FACTOR FOR WASTE CONTAINMENT FROM WASTE MANAGEMENT PRACTICES

GROSS TOTAL SCORE x	WASTE MANAGEMENT PRACTICES FACTOR x		FINAL SCORE
54)(	1)	=	54

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HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE STAINED AREAS (SITE 3)
LOCATION NAKNEK CAMP I, ALASKA
DATE OF OPERATION OCCURRENCE 1956 TO 1977
OWNER/OPERATOR ALASKAN AIR COMMAND
COMMENTS/DESCRIPTION
RATED BY HMTC

I. RECEPTORS

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
A. POPULATION WITHIN 1000 FEET OF SITE	:	0	4	0	12
B. DISTANCE TO NEAREST WELL	:	2	10	20	30
C. LAND USE/ZONING WITHIN 1 MILE RADIUS	:	0	3	0	9
D. DISTANCE TO INSTALLATION BOUNDARY	:	3	6	18	18
E. CRITICAL ENVIRONMENTS WITHIN 1 MILE RADIUS OF SITE	:	2	10	20	30
F. WATER QUALITY OF NEAREST SURFACE WATER	:	1	6	6	18
G. GROUND WATER USE OF UPPERMOST AQUIFER	:	0	9	0	27
H. POPULATION (WITHIN 3 MILES) SERVED BY					
DOWN STREAM SURFACE WATER	:	0	6	0	18
GROUND WATER	:	2	6	12	18
	SUBTOTALS			76	180

RECEPTORS SUBSCORE (100 X FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL) 42

II. WASTE CHARACTERISTICS

A. SELECT THE FACTOR SCORE BASED ON THE ESTIMATED QUANTITY, THE DEGREE OF HAZARD, AND THE CONFIDENCE LEVEL OF THE INFORMATION.

1. WASTE QUANTITY (S=SMALL, M=MEDIUM, L=LARGE) (S)
2. CONFIDENCE LEVEL (S=SUSPECT, C=CONFIRM) (S)
3. HAZARD RATING (L=LOW, M=MEDIUM, H=HIGH) (H)

FACTOR SUBSCORE A (40)
(FROM 20 TO 100 BASED ON FACTOR SCORE MATRIX)

B. APPLY PERSISTENCE FACTOR

FACTOR SUBSCORE A x PERSISTENCE FACTOR = SUBSCORE B
(40) (1) = (40)

C. APPLY PHYSICAL STATE MULTIPLIER

SUBSCORE B x PHYSICAL STATE MULTIPLIER = WASTE CHARACTERISTICS SUBSCORE
(40) (1) = (40)

III. PATHWAY

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE

A. IF THERE IS EVIDENCE OF MIGRATION OF HAZARDOUS CONTAMINANTS, ASSIGN MAXIMUM FACTOR SUBSCORE OF 100 POINTS FOR DIRECT EVIDENCE OR 80 POINTS FOR INDIRECT EVIDENCE. IF DIRECT EVIDENCE EXISTS THEN PROCEED TO C. IF NO EVIDENCE OR INDIRECT EVIDENCE (80 OR LESS) EXISTS, PROCEED TO B.

30

B. RATE THE MIGRATION POTENTIAL FOR 3 POTENTIAL PATHWAYS: SURFACE WATER MIGRATION, FLOODING, AND GROUND-WATER MIGRATION. SELECT THE HIGHEST RATING, AND PROCEED TO C.

1. SURFACE WATER MIGRATION

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
DISTANCE TO NEAREST SURFACE WATER	:	2	8	16	24
NET PRECIPITATION	:	1	6	6	18
SURFACE EROSION	:	2	8	16	24
SURFACE PERMEABILITY	:	2	6	12	18
RAINFALL INTENSITY	:	1	8	8	24
SUBTOTALS				58	108
SUBSCORE (100 X FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL)					54

2. FLOODING

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
FLOODING		0	1	0	3
SUBSCORE (100 X FACTOR SCORE /3)	:				0

3. GROUND WATER MIGRATION

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
DEPTH TO GROUND WATER	:	1	8	8	24
NET PRECIPITATION	:	1	[illegible]	6	18
SOIL PERMEABILITY	:	2	8	16	24
SUBSURFACE FLOWS	:	0	8	0	24
DIRECT ACCESS TO GROUND WATER	:	0	8	0	24
SUBTOTALS				30	114
SUBSCORE (100 X FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL)					26

C. HIGHEST PATHWAY SUBSCORE

ENTER THE HIGHEST SUBSCORE VALUE FROM A, B-1, B-2 OR B-3 ABOVE.

54

IV. WASTE MANAGEMENT PRACTICES

A. AVERAGE THE THREE SUBSCORES FOR RECEPTORS, WASTE CHARACTERISTICS, AND PATHWAYS.

RECEPTORS	42
WASTE CHARACTERISTICS	[illegible]
PATHWAYS	54
TOTAL DIVIDED BY 3 = GROSS TOTAL SCORE	54

B. APPLY FACTOR FOR WASTE CONTAINMENT FROM WASTE MANAGEMENT PRACTICES

GROSS TOTAL SCORE		WASTE MANAGEMENT PRACTICES FACTOR		FINAL SCORE
54	X	1	=	54

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APPENDIX E

PHOTOGRAPHS

Photo 1. Foliage on the hill (viewed west).

Photo 2. Top of the hill (viewed south).

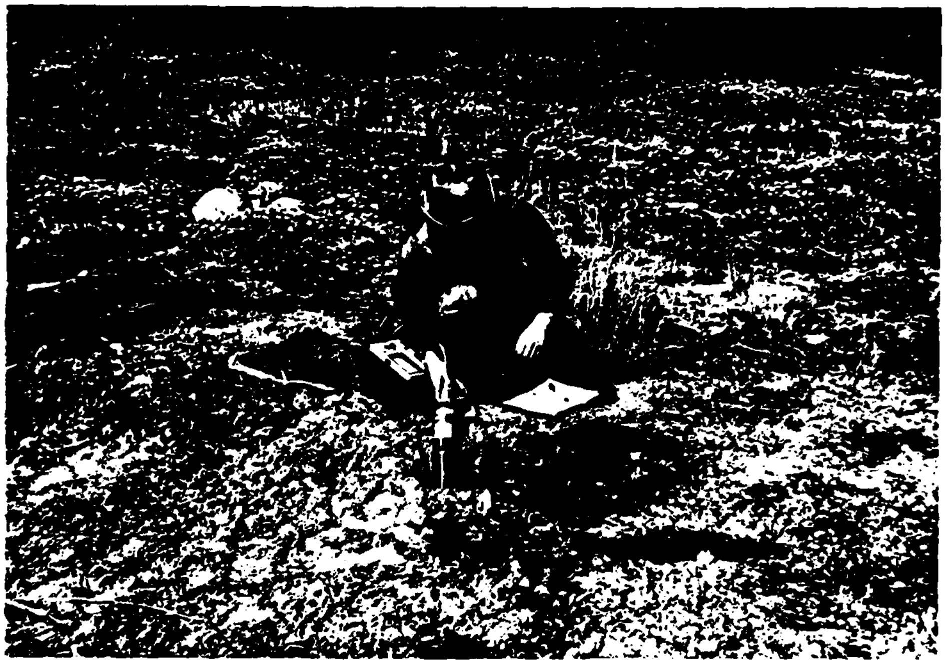

Photo 3. PID survey from the top of the hill (viewed west).

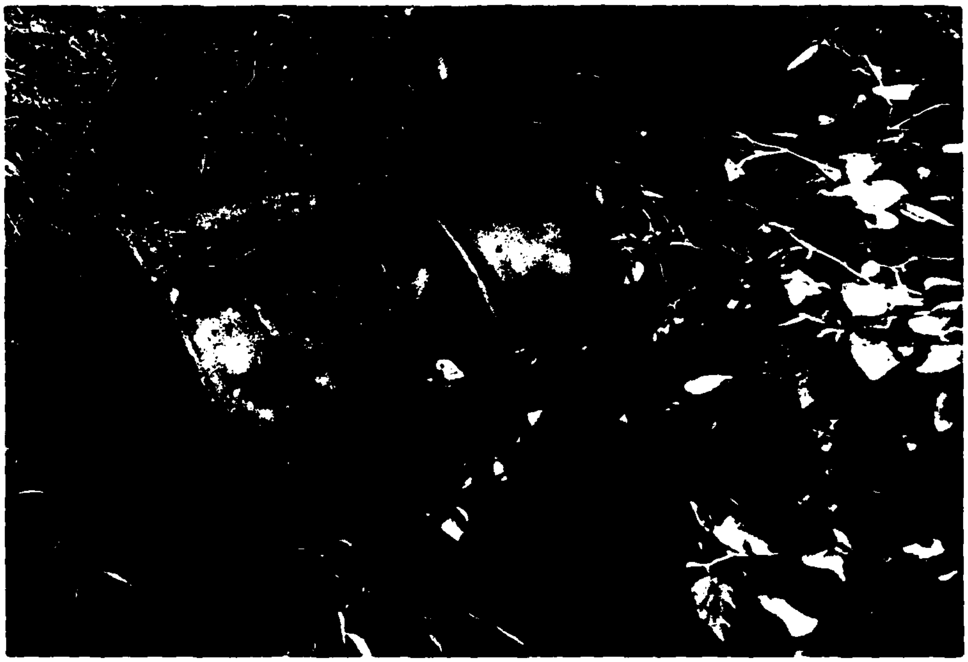

Photo 4. Punctured glycol barrel (viewed north).

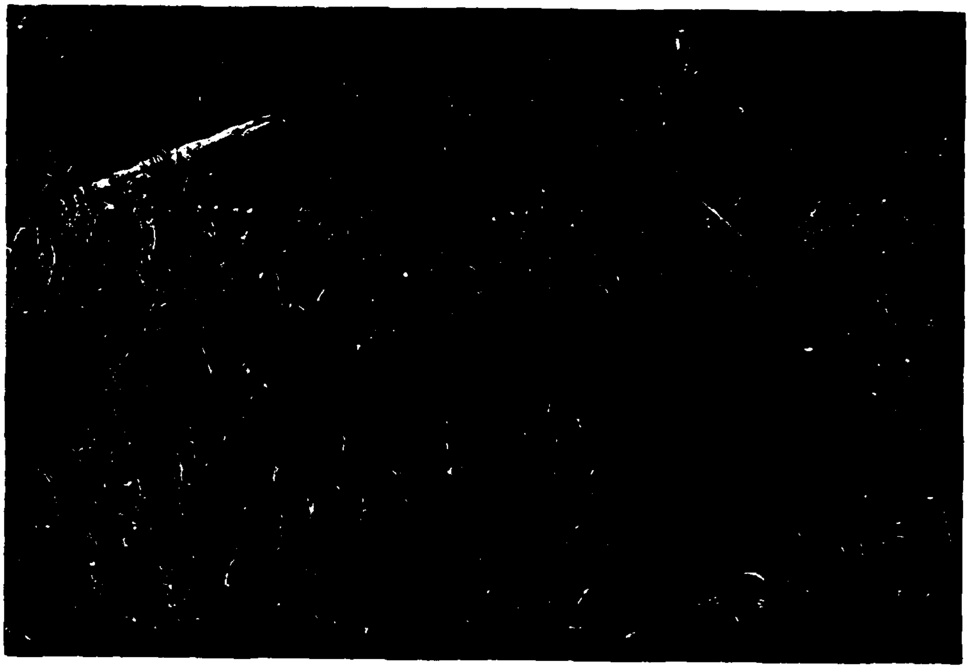

Photo 5. 55-gallon drums on the hillside (viewed north).

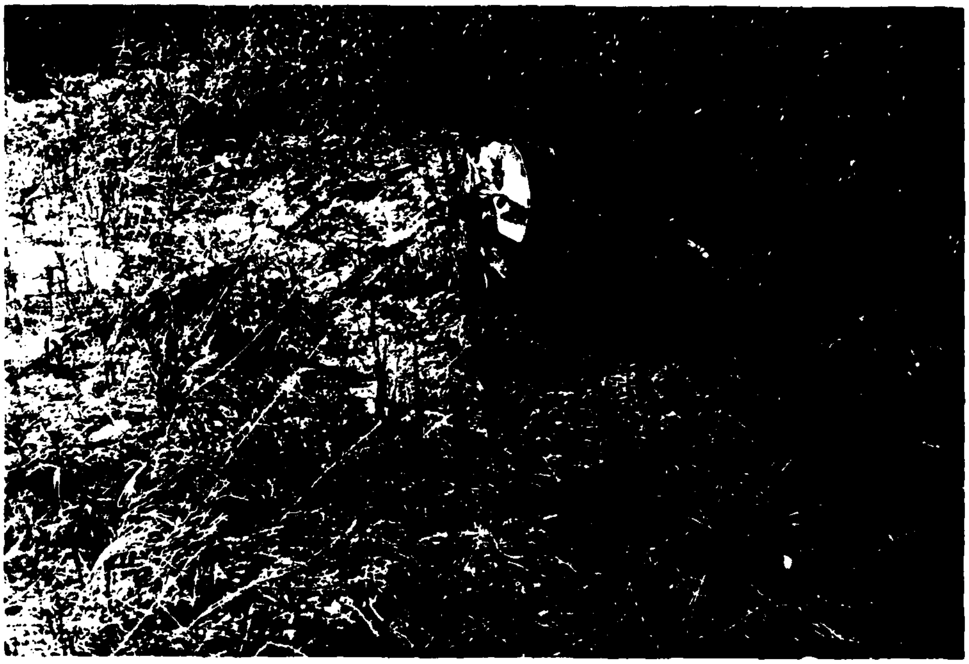

Photo 6. 55-gallon drum towards the bottom of the hill (viewed north).

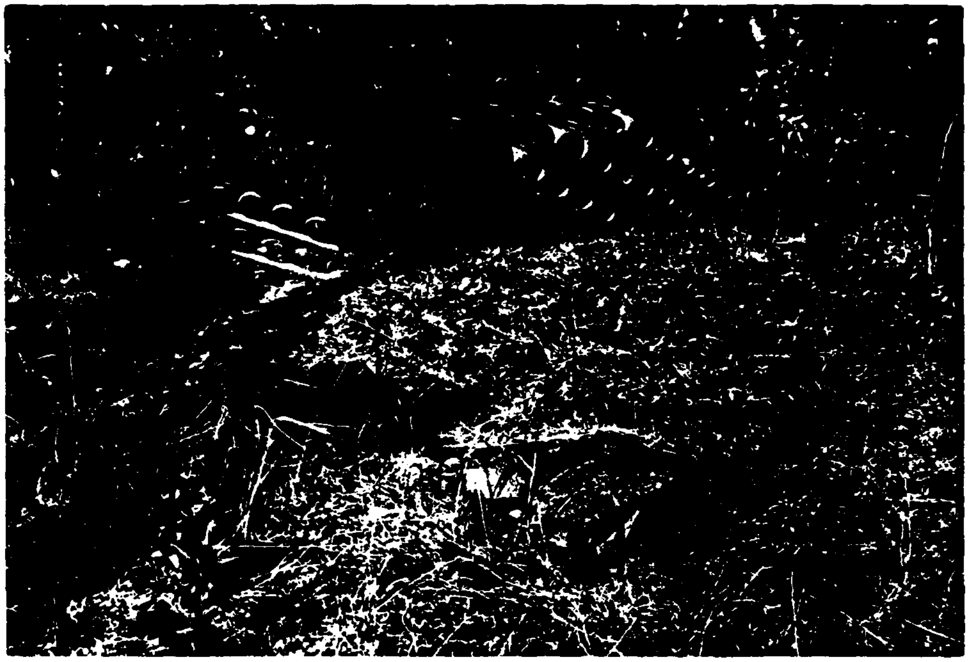

Photo 7. Construction steel at the bottom of the hill (viewed north).

Photo 8. Construction steel at the bottom of the hill (viewed south).

Photo 9. Partially buried drums behind quonset hut 3 (viewed southwest).

Photo 10. Large stained area next to quonset hut 1 (viewed south).

Photo 11. PID survey at the smaller stained area (viewed south).

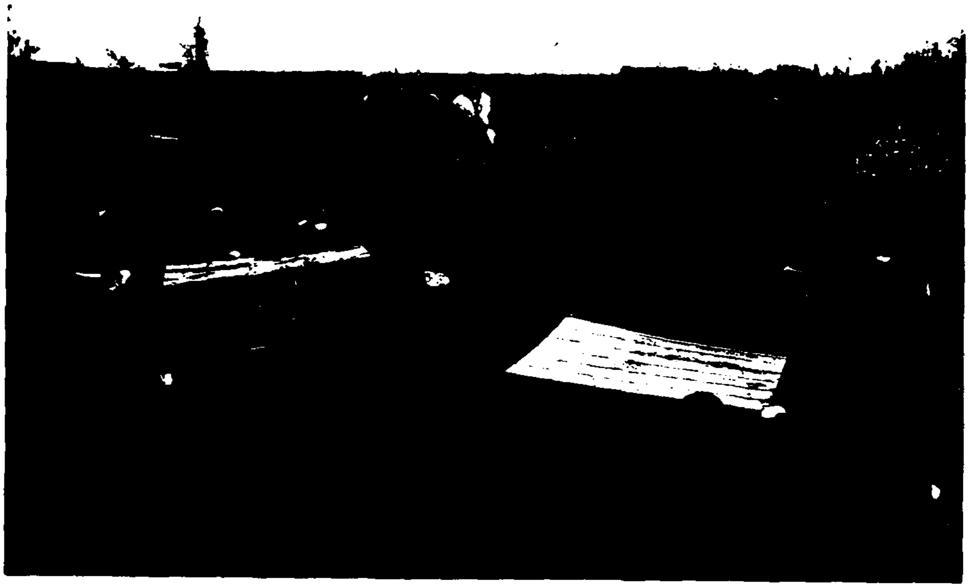

Photo 12. Graded area with some minor construction debris (viewed north).